PAMS Technical Documentation
NPM–9 Series Transceivers

Troubleshooting Instructions

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CONTENTS

Transceiver Troubleshooting 3
Baseband Troubleshooting 3
PWB Test Points 3
Measurement Points 4
Troubleshooting steps 4
Main troubleshooting tree 5
Phone is dead 7
Flash programming doesn't work 8
Phone is jammed 10
Charging fault 12
SIM card is out of order (insert SIM card) 13
Audio fault 14
Display fault 18
Keypad fault 21
RF Troubleshooting 24
Introduction 24
RF Key Components 25
PWB Test Points 26
Transmitter 27
Transmitter troubleshooting diagram 28
Transmitter signals 31
Receiver 33
Receiver troubleshooting diagram for GSM900 34
Receiver troubleshooting diagram for GSM1800 35
LNA gainstep checking GSM900 & GSM1800 36
Synthesizer 37
Synthesizer troubleshooting diagram 38
Synthesizer signals 39
FM Radio troubleshooting 41
FM Radio troubleshooting diagram 42
FM Radio signals 43

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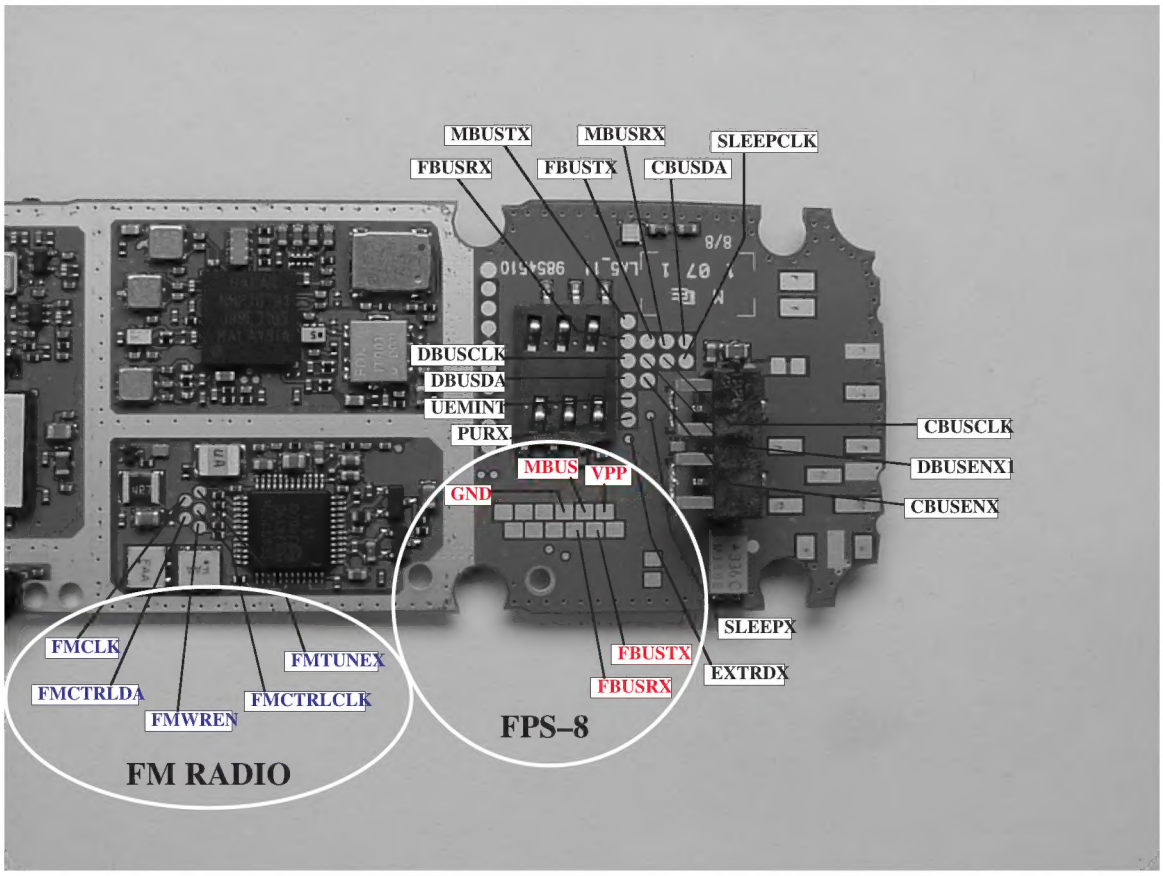
Transceiver Troubleshooting

Baseband Troubleshooting

PWB Test Points



BLACK colored test points are connected to the lines between UEM and UPP where the logic level is 1.8 V.

RED colored test points are connected to the lines from FPS–8 and have 2.7 V logic level.

BLUE test points are connected to FM radio lines and have 1.8 V logic level.

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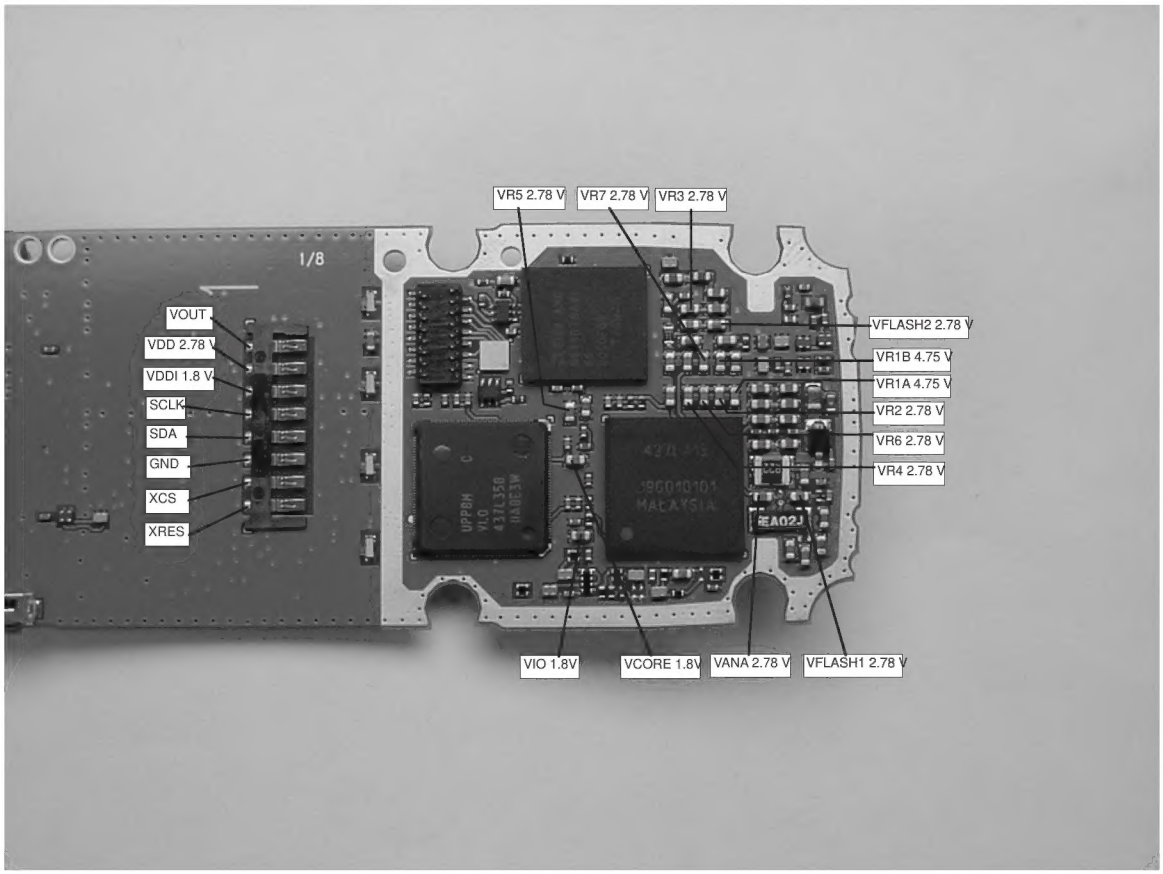
Measurement Points



Troubleshooting steps

The following hints help to find the problem if the circuitry seems to be faulty. The instructions are divided into following sections:

1. Phone is totally dead
2. Flash programming doesn't work
3. Power doesn't stay on or the phone is jammed
4. Charging fault
5. Plug in SIM card is out of order (insert SIM card).
6. Audio fault
7. Display is not working
8. Keypad fault

The first thing to do is carry out a through visual check of the module. Ensure in particular that:

a) there are not any mechanical damages
b) soldered joints are OK

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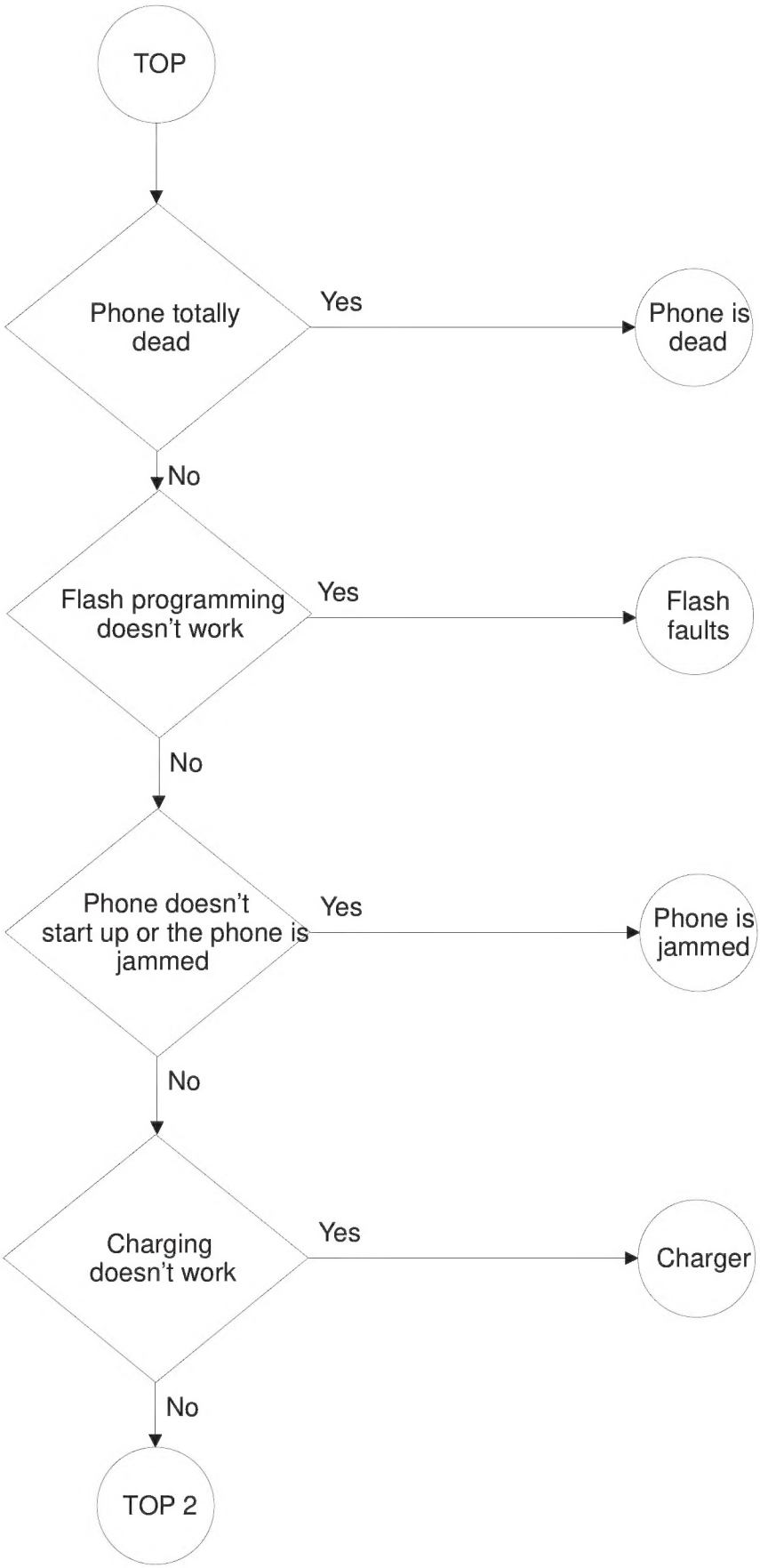
Main troubleshooting tree



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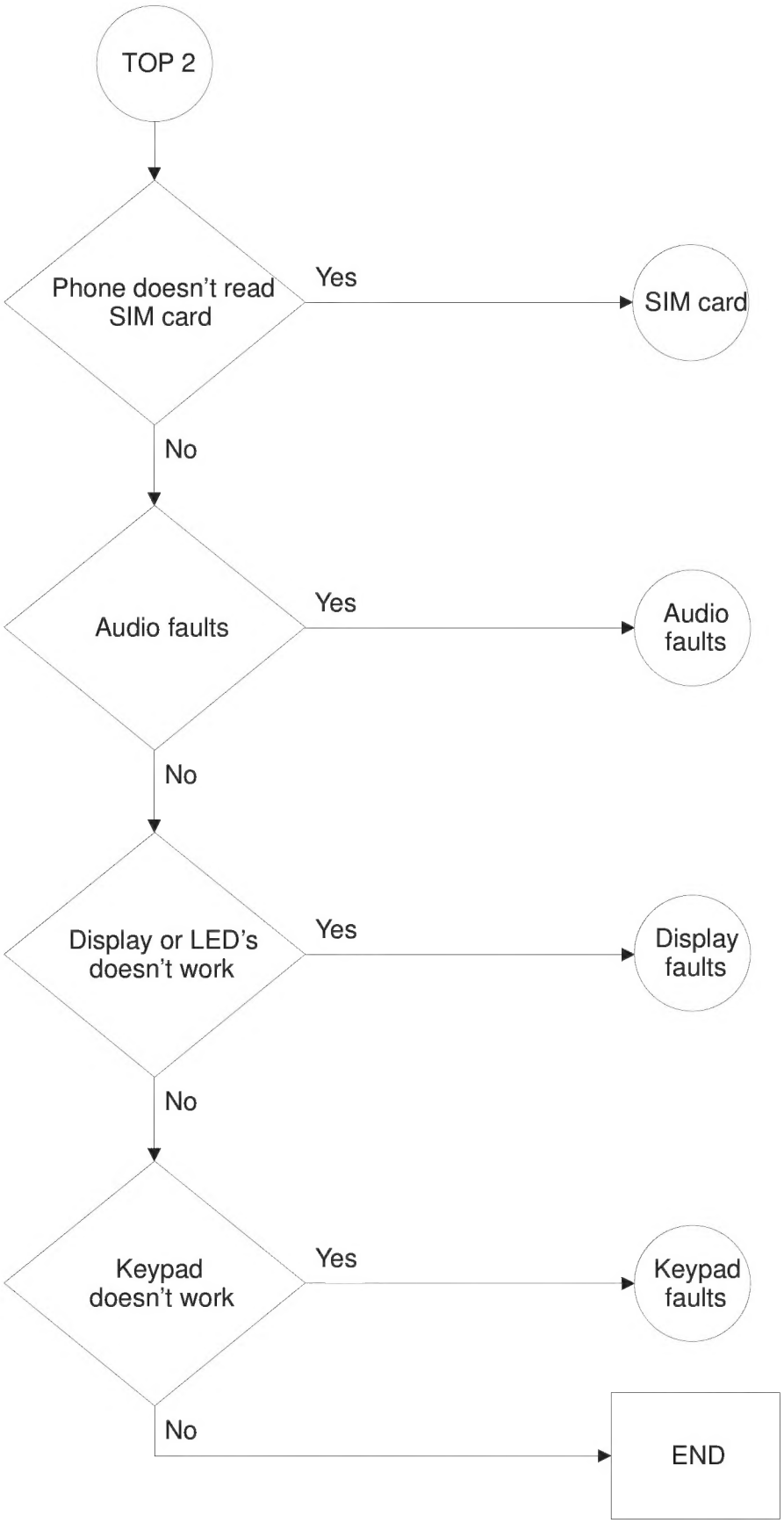

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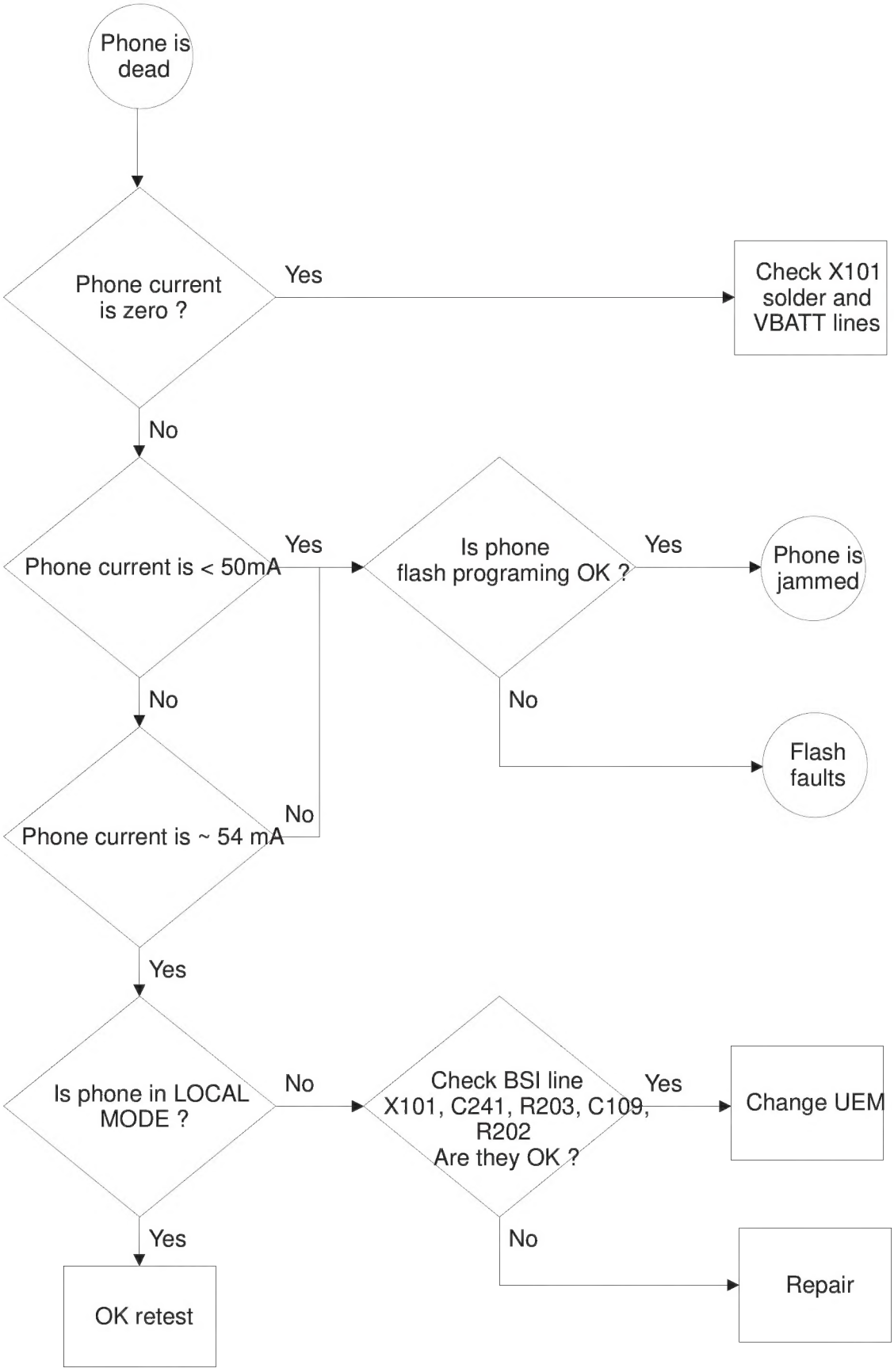
Phone is dead



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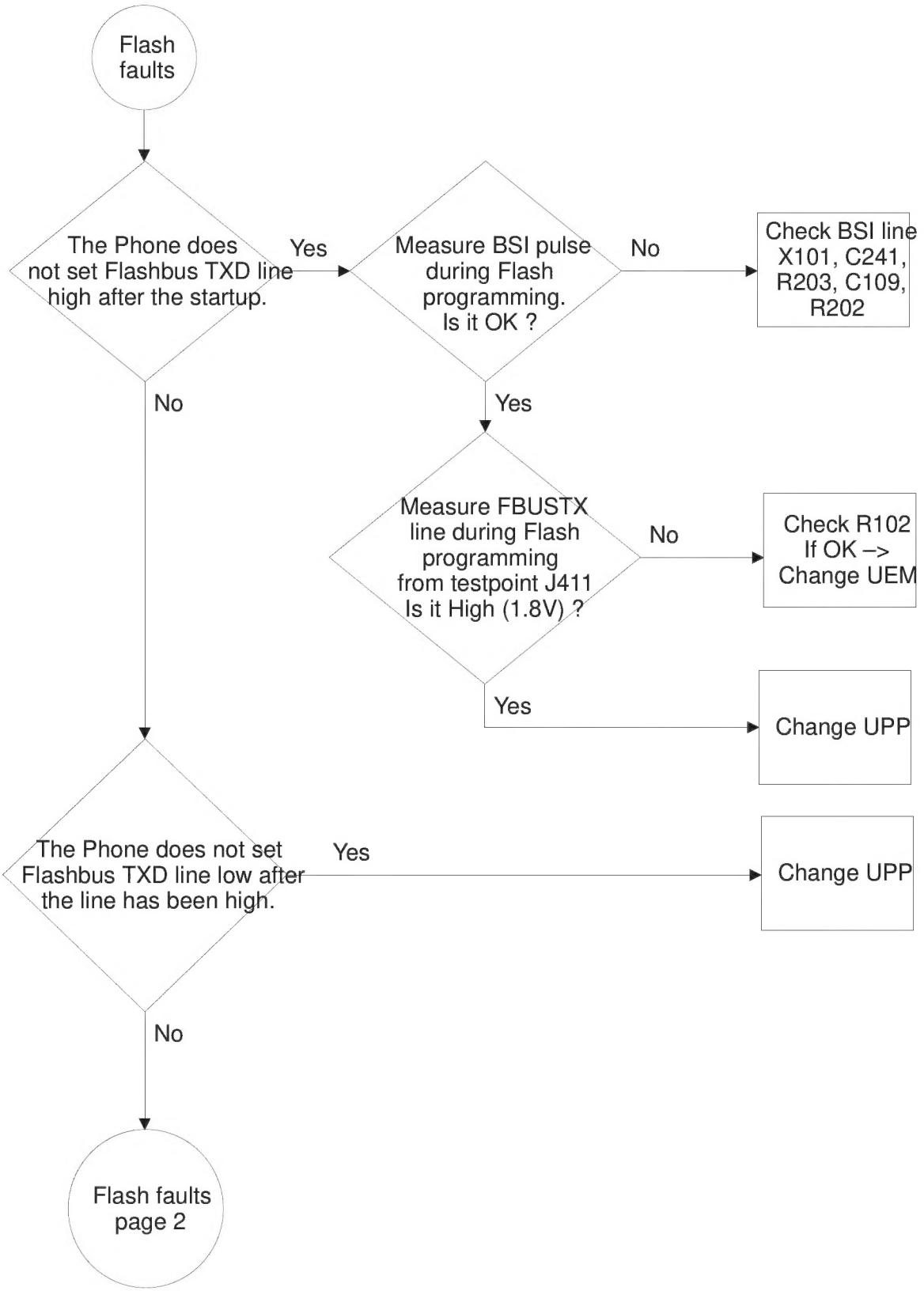
Flash programming doesn't work


Flash faults
The Phone does not set Flashbus TXD line high after the startup.
Yes
Measure BSI pulse during Flash programming. Is it OK ?
No
Check BSI line X101, C241, R203, C109, R202
No
Yes
Measure FBUSTX line during Flash programming from testpoint J411 Is it High (1.8V) ?
No
Check R102 If OK –> Change UEM
Yes
Change UPP
The Phone does not set Flashbus TXD line low after the line has been high.
Yes
Change UPP
No
Flash faults page 2

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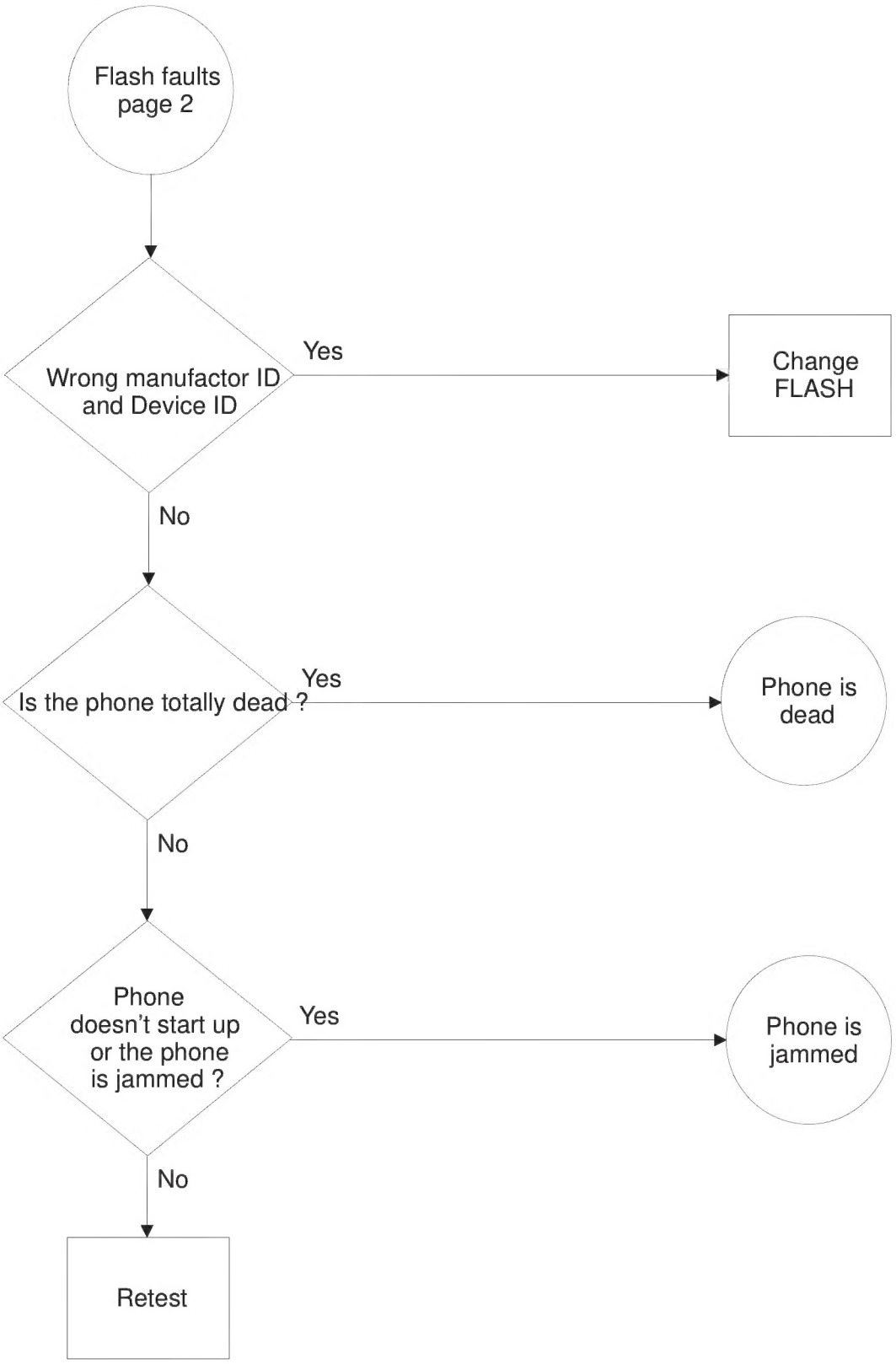

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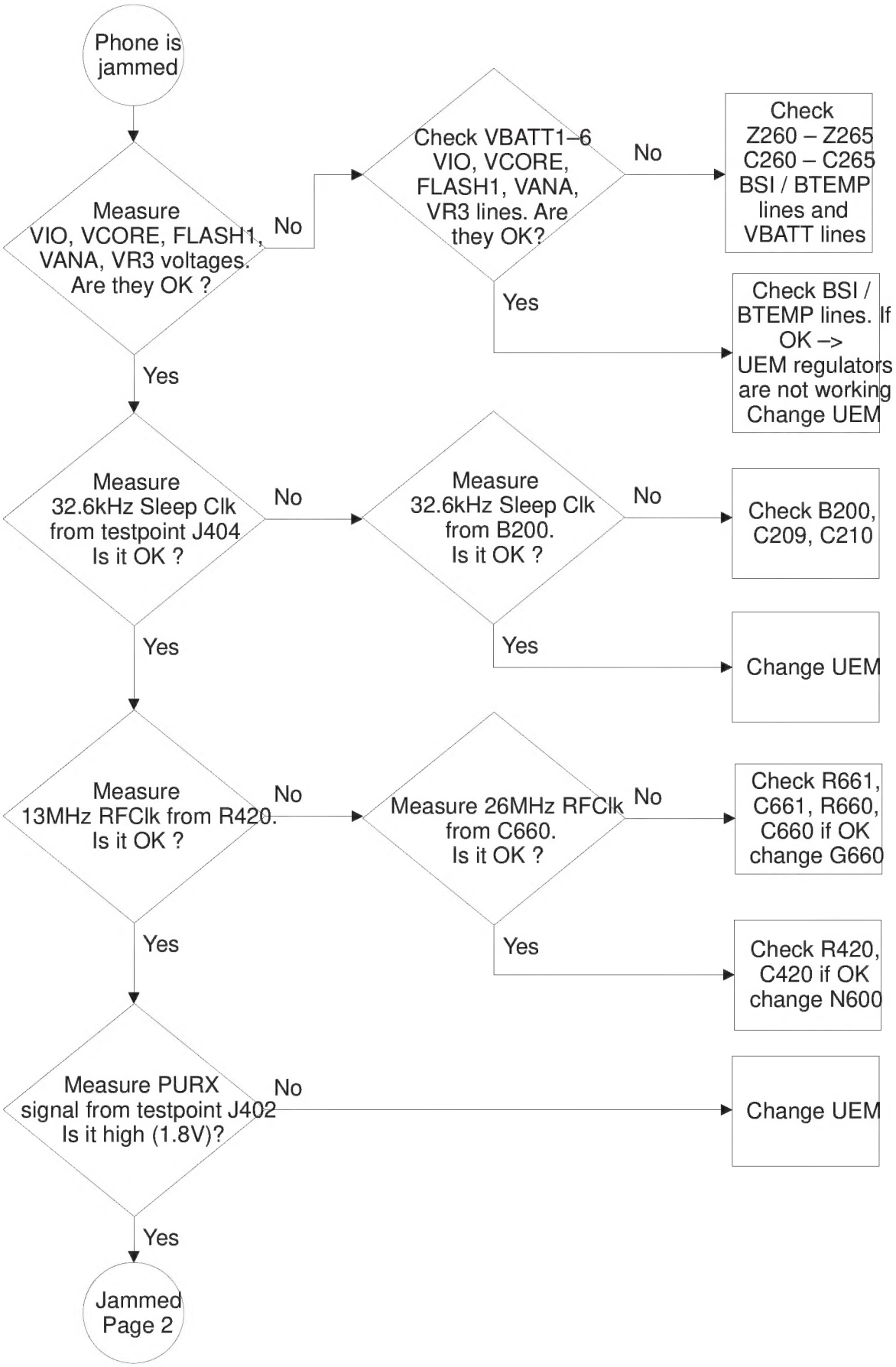
Phone is jammed


Phone is jammed
Measure VIO, VCORE, FLASH1, VANA, VR3 voltages. Are they OK ?
No
Check VBATT1–6 VIO, VCORE, FLASH1, VANA, VR3 lines. Are they OK?
No
Check Z260 – Z265 C260 – C265 BSI / BTEMP lines and VBATT lines
Yes
Check BSI / BTEMP lines. If OK –> UEM regulators are not working Change UEM
Yes
Measure 32.6kHz Sleep Clk from testpoint J404 Is it OK ?
No
Measure 32.6kHz Sleep Clk from B200. Is it OK ?
No
Check B200, C209, C210
Yes
Yes
Change UEM
Measure 13MHz RFClk from R420. Is it OK ?
No
Measure 26MHz RFClk from C660. Is it OK ?
No
Check R661, C661, R660, C660 if OK change G660
Yes
Yes
Check R420, C420 if OK change N600
Measure PURX signal from testpoint J402 Is it high (1.8V)?
No
Change UEM
Yes
Jammed Page 2

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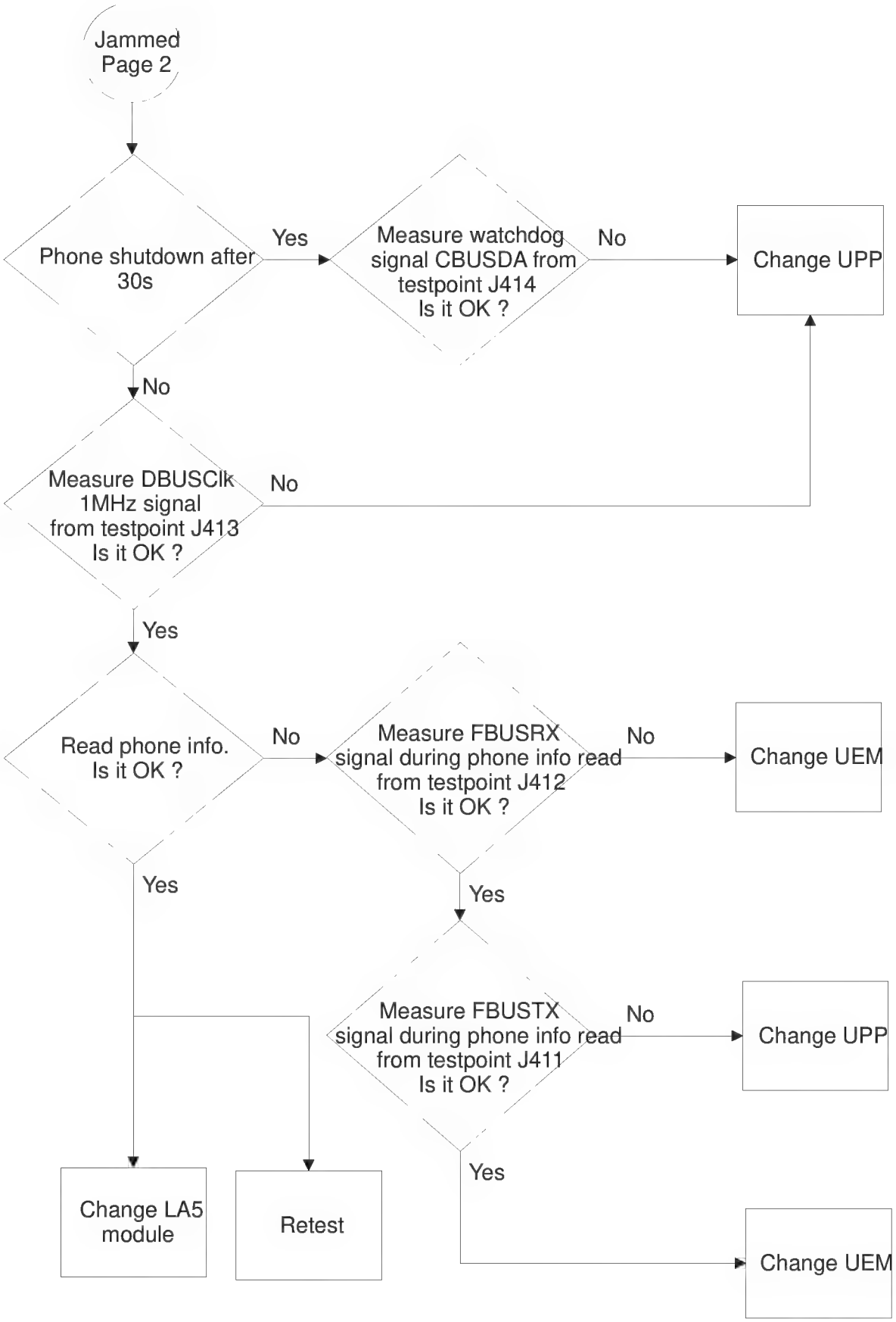

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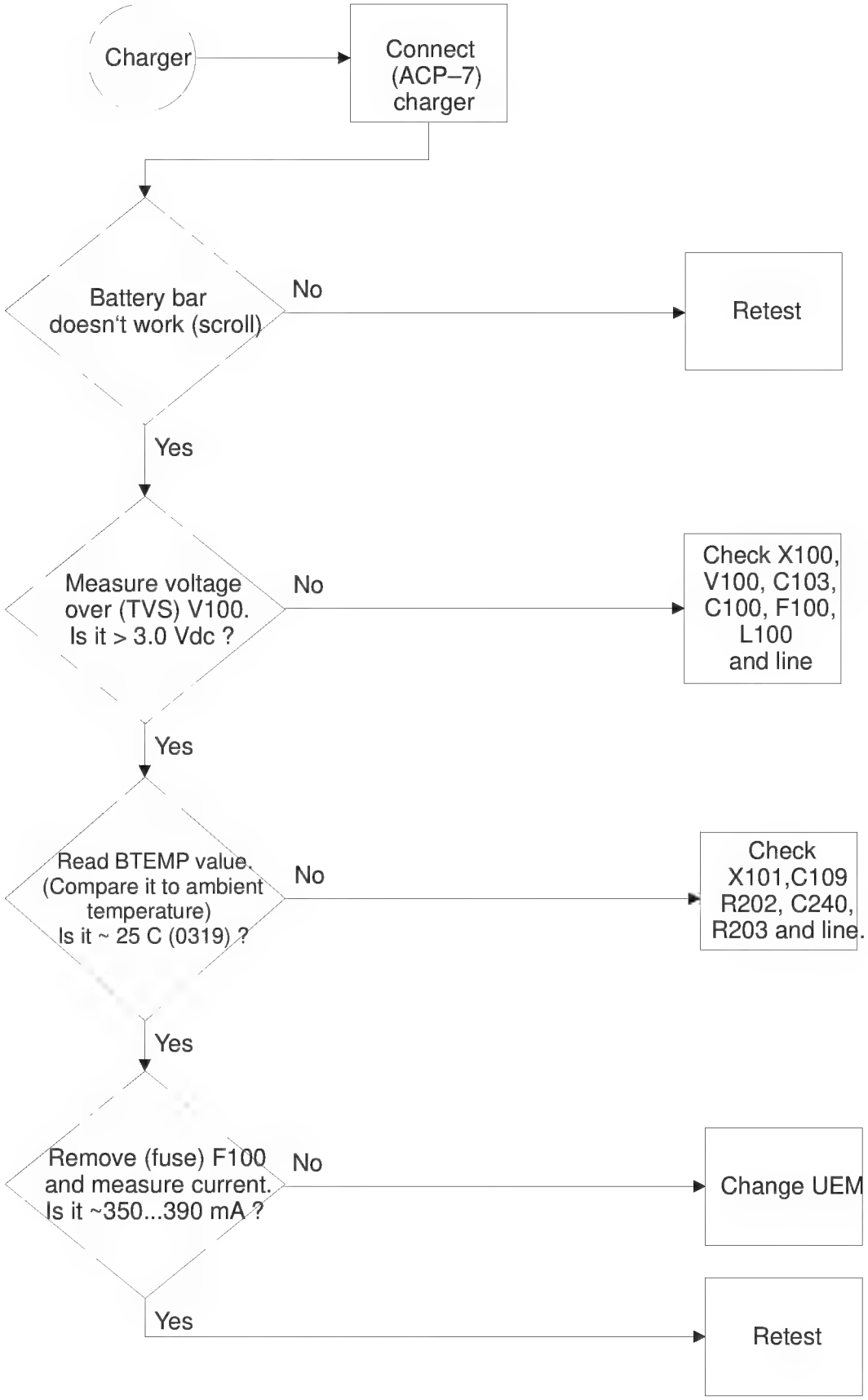
Charging fault



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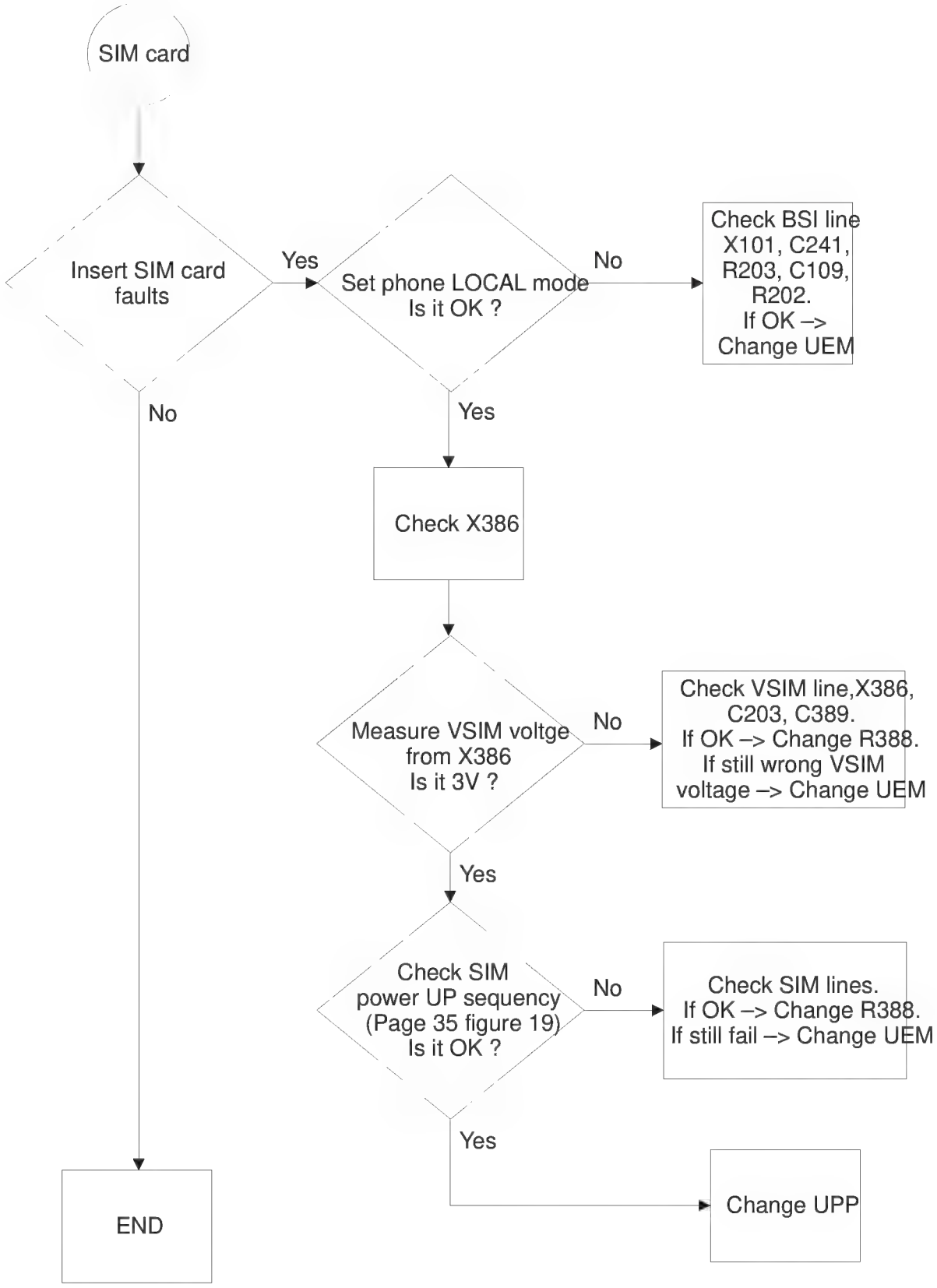
SIM card is out of order (insert SIM card)


SIM card
Insert SIM card faults
Yes
Set phone LOCAL mode Is it OK ?
No
Check BSI line X101, C241, R203, C109, R202. If OK –> Change UEM
No
Yes
Check X386
Measure VSIM voltge from X386 Is it 3V ?
No
Check VSIM line,X386, C203, C389. If OK –> Change R388. If still wrong VSIM voltage –> Change UEM
Yes
Check SIM power UP sequency (Page 35 figure 19) Is it OK ?
No
Check SIM lines. If OK –> Change R388. If still fail –> Change UEM
Yes
Change UPP
END

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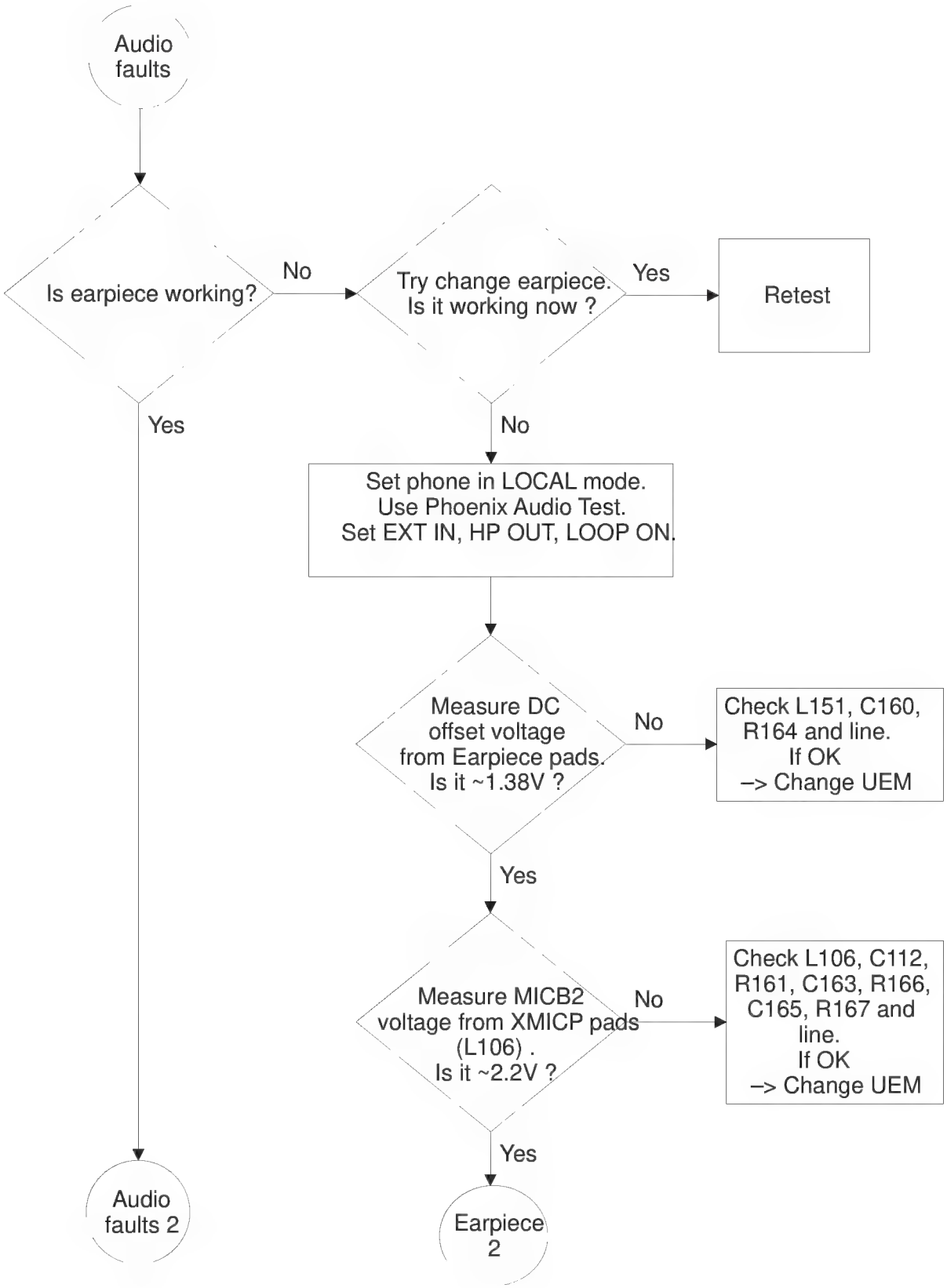
Audio fault


Audio faults
Is earpiece working?
No
Try change earpiece. Is it working now ?
Yes
Retest
Yes
No
Set phone in LOCAL mode. Use Phoenix Audio Test. Set EXT IN, HP OUT, LOOP ON.
Measure DC offset voltage from Earpiece pads. Is it ~1.38V ?
No
Check L151, C160, R164 and line. If OK –> Change UEM
Yes
Measure MICB2 voltage from XMICP pads (L106) . Is it ~2.2V ?
No
Check L106, C112, R161, C163, R166, C165, R167 and line. If OK –> Change UEM
Yes
Audio faults 2
Earpiece 2

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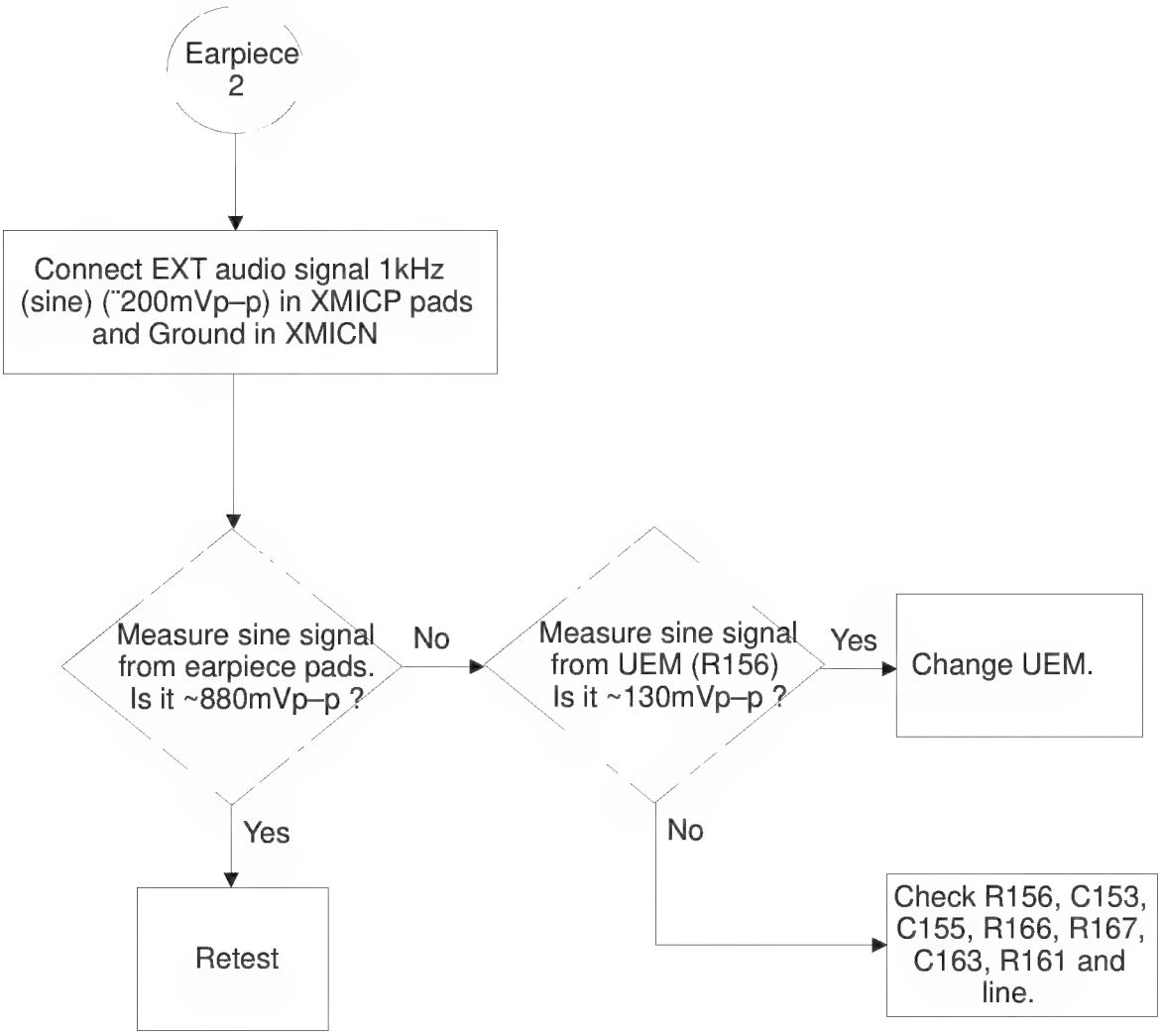
Earpiece 2
Connect EXT audio signal 1kHz (sine) (¨200mVp–p) in XMICP pads and Ground in XMICN
Measure sine signal from earpiece pads. Is it ~880mVp–p ?
No
Measure sine signal from UEM (R156) Is it ~130mVp–p ?
Yes
Change UEM.
Yes
Retest
No
Check R156, C153, C155, R166, R167, C163, R161 and line.

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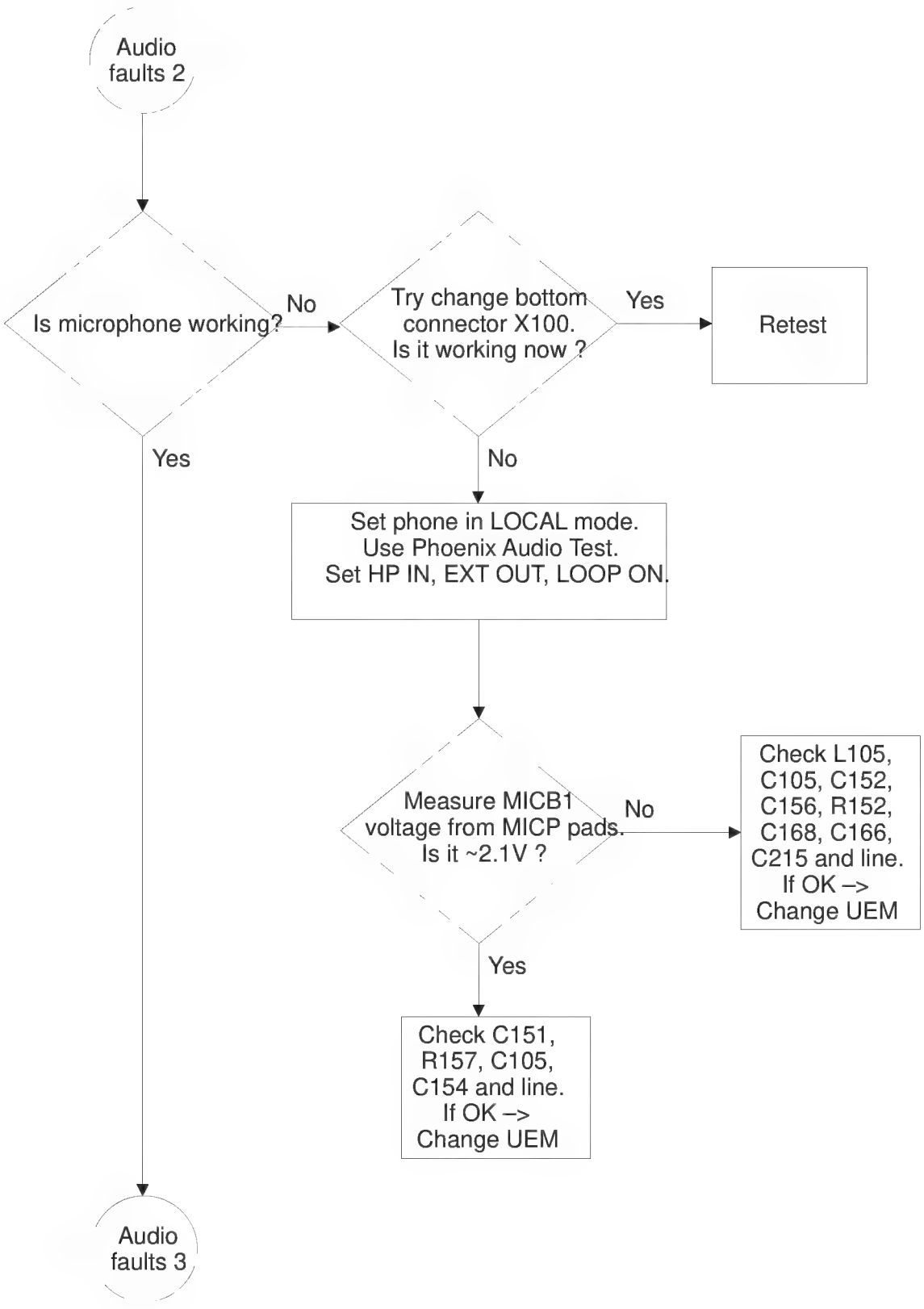
Audio faults 2
Is microphone working?
No
Try change bottom connector X100. Is it working now ?
Yes
Retest
Yes
No
Set phone in LOCAL mode. Use Phoenix Audio Test. Set HP IN, EXT OUT, LOOP ON.
Measure MICB1 voltage from MICP pads. Is it ~2.1V ?
No
Check L105, C105, C152, C156, R152, C168, C166, C215 and line. If OK –> Change UEM
Yes
Check C151, R157, C105, C154 and line. If OK –> Change UEM
Audio faults 3

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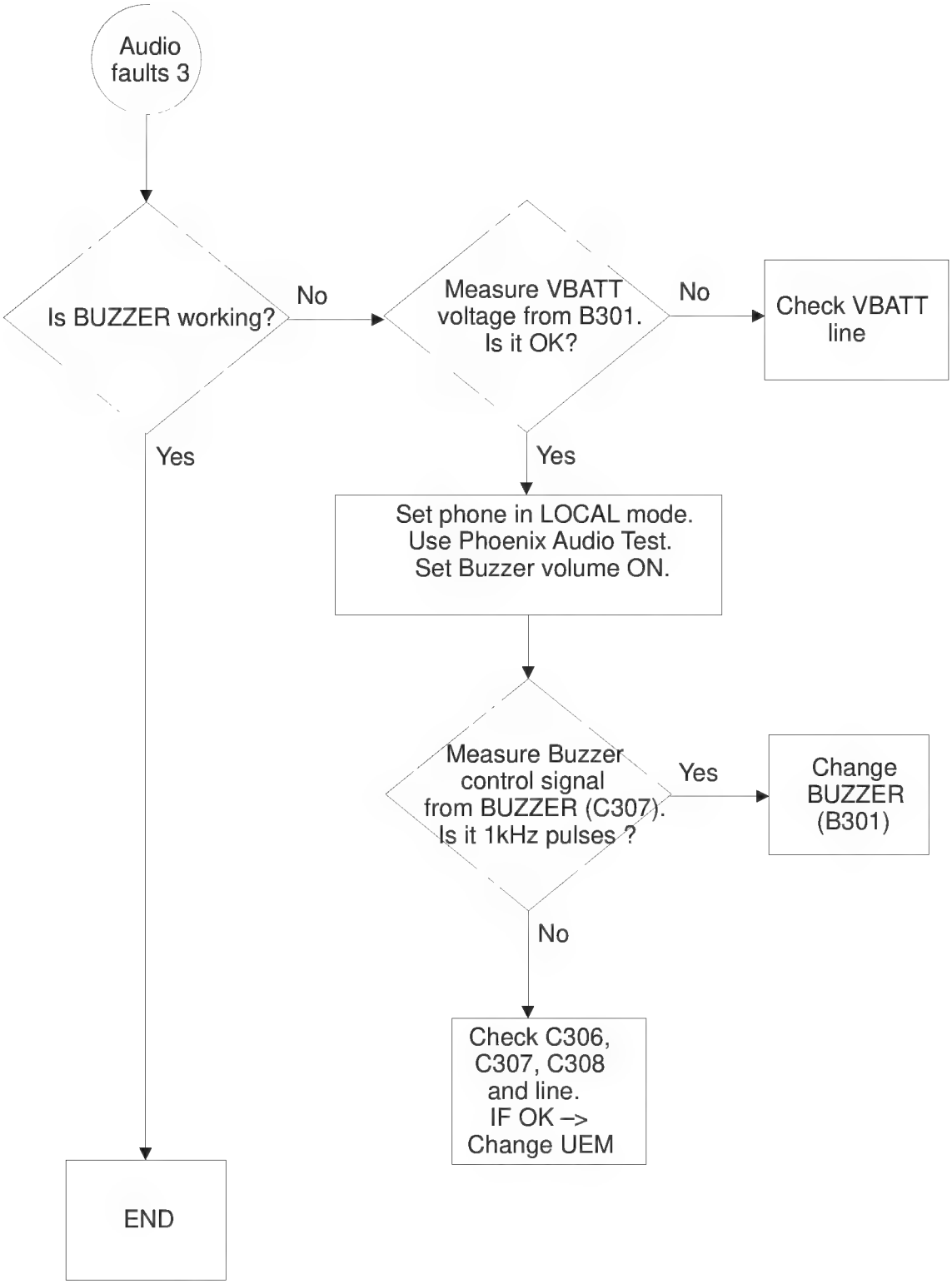
Audio faults 3
Is BUZZER working?
No
Measure VBATT voltage from B301. Is it OK?
No
Check VBATT line
Yes
Yes
Set phone in LOCAL mode. Use Phoenix Audio Test. Set Buzzer volume ON.
Measure Buzzer control signal from BUZZER (C307). Is it 1kHz pulses ?
Yes
Change BUZZER (B301)
No
Check C306, C307, C308 and line. IF OK –> Change UEM
END

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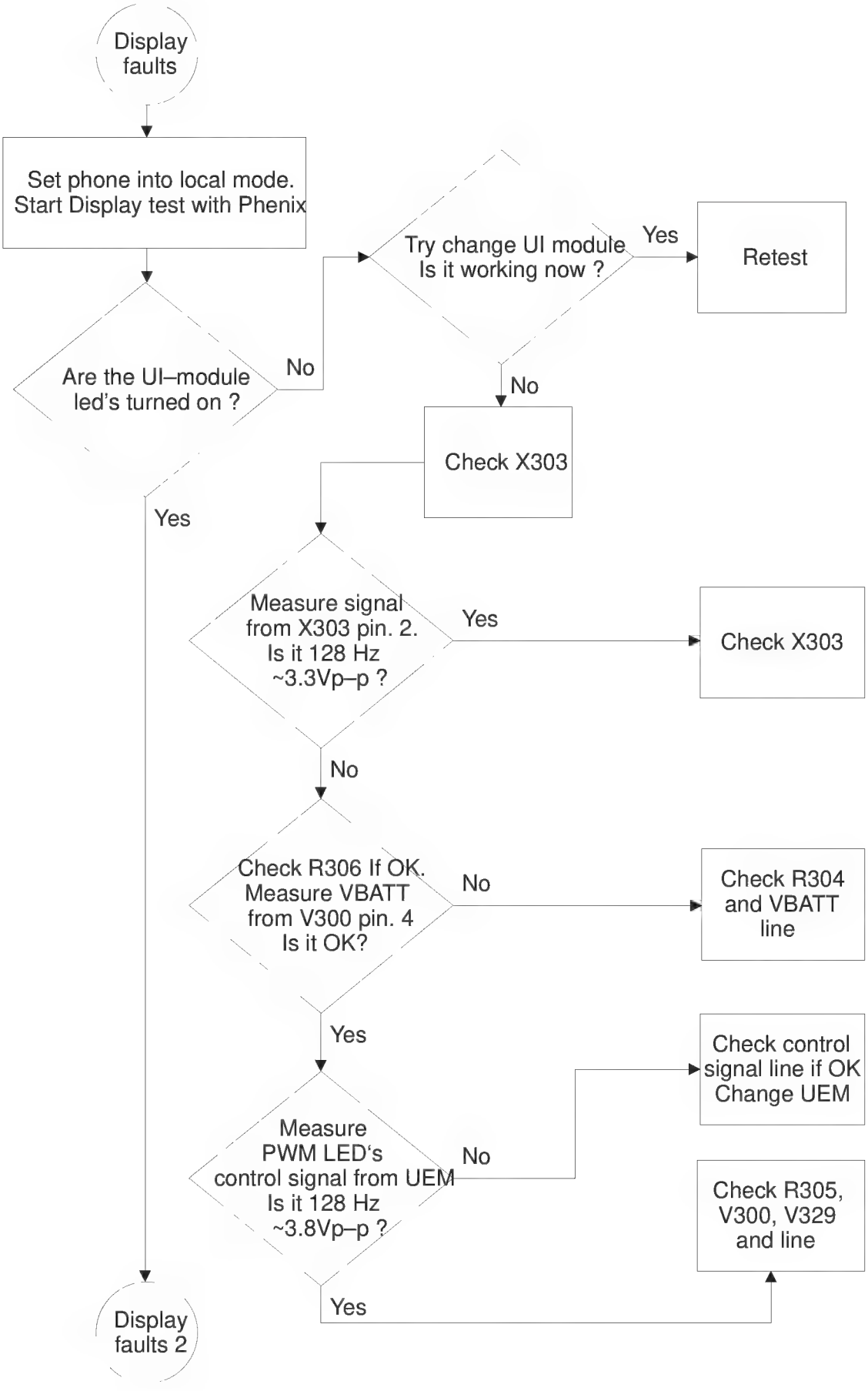
Display fault


Display faults
Set phone into local mode. Start Display test with Phenix
Are the UI–module led's turned on ?
No
Try change UI module Is it working now ?
Yes
Retest
No
Check X303
Yes
Measure signal from X303 pin. 2. Is it 128 Hz ~3.3Vp–p ?
Yes
Check X303
No
Check R306 If OK. Measure VBATT from V300 pin. 4 Is it OK?
No
Check R304 and VBATT line
Yes
Measure PWM LED's control signal from UEM Is it 128 Hz ~3.8Vp–p ?
No
Check control signal line if OK Change UEM
Check R305, V300, V329 and line
Yes
Display faults 2

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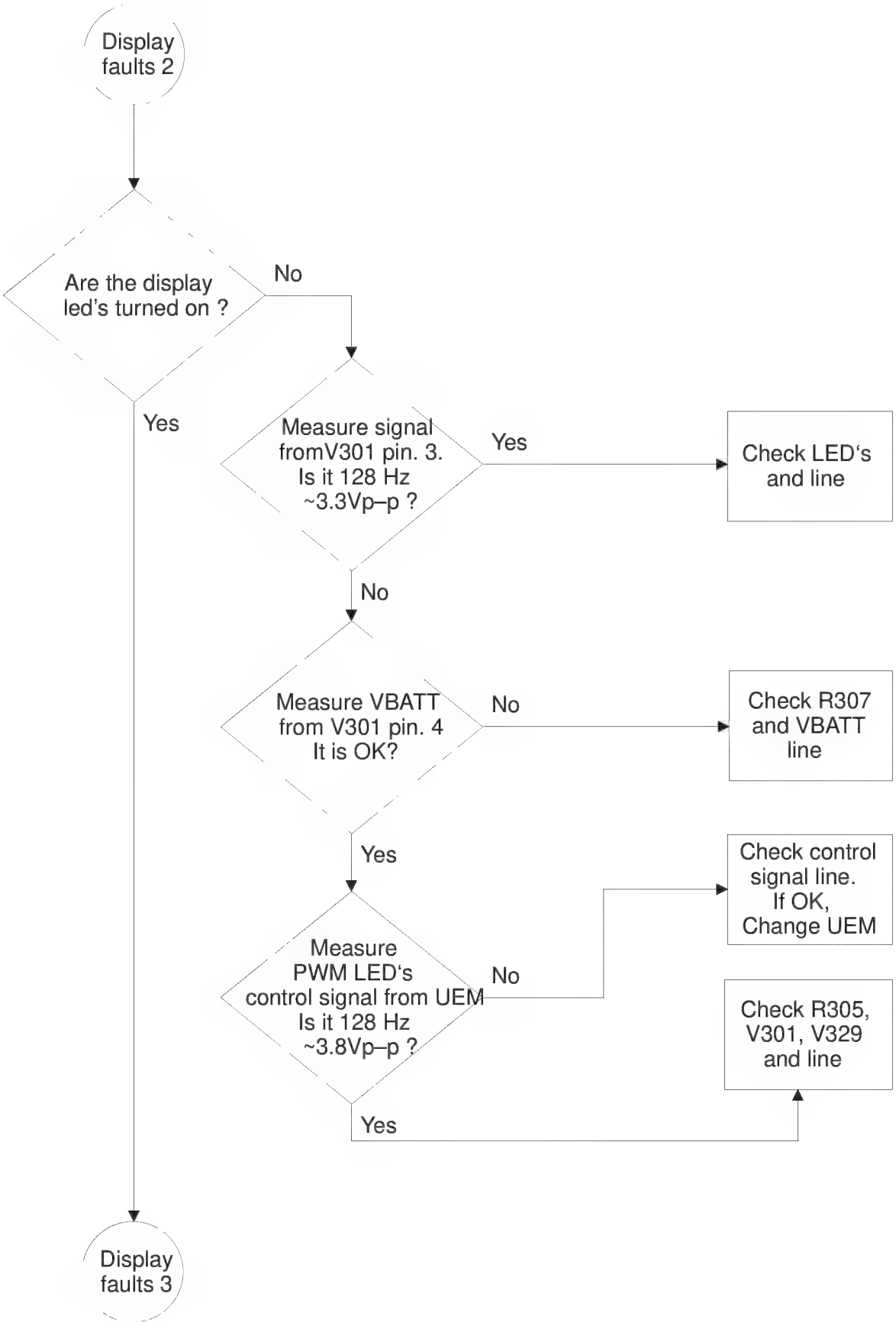
Display faults 2
Are the display led's turned on ?
No
Yes
Measure signal fromV301 pin. 3. Is it 128 Hz ~3.3Vp–p ?
Yes
Check LED's and line
No
Measure VBATT from V301 pin. 4 It is OK?
No
Check R307 and VBATT line
Yes
Measure PWM LED's control signal from UEM Is it 128 Hz ~3.8Vp–p ?
No
Check control signal line. If OK, Change UEM
Check R305, V301, V329 and line
Yes
Display faults 3

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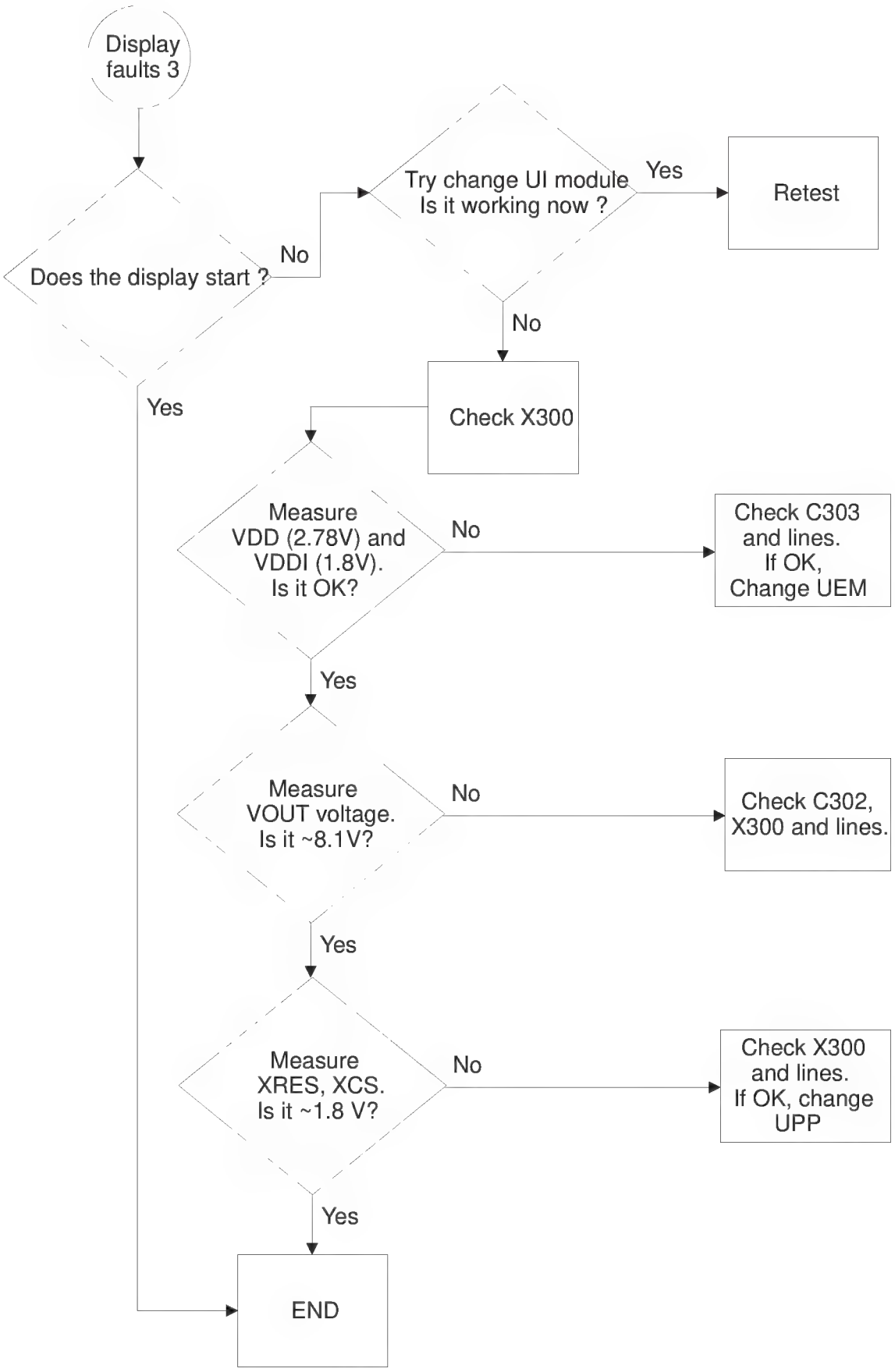

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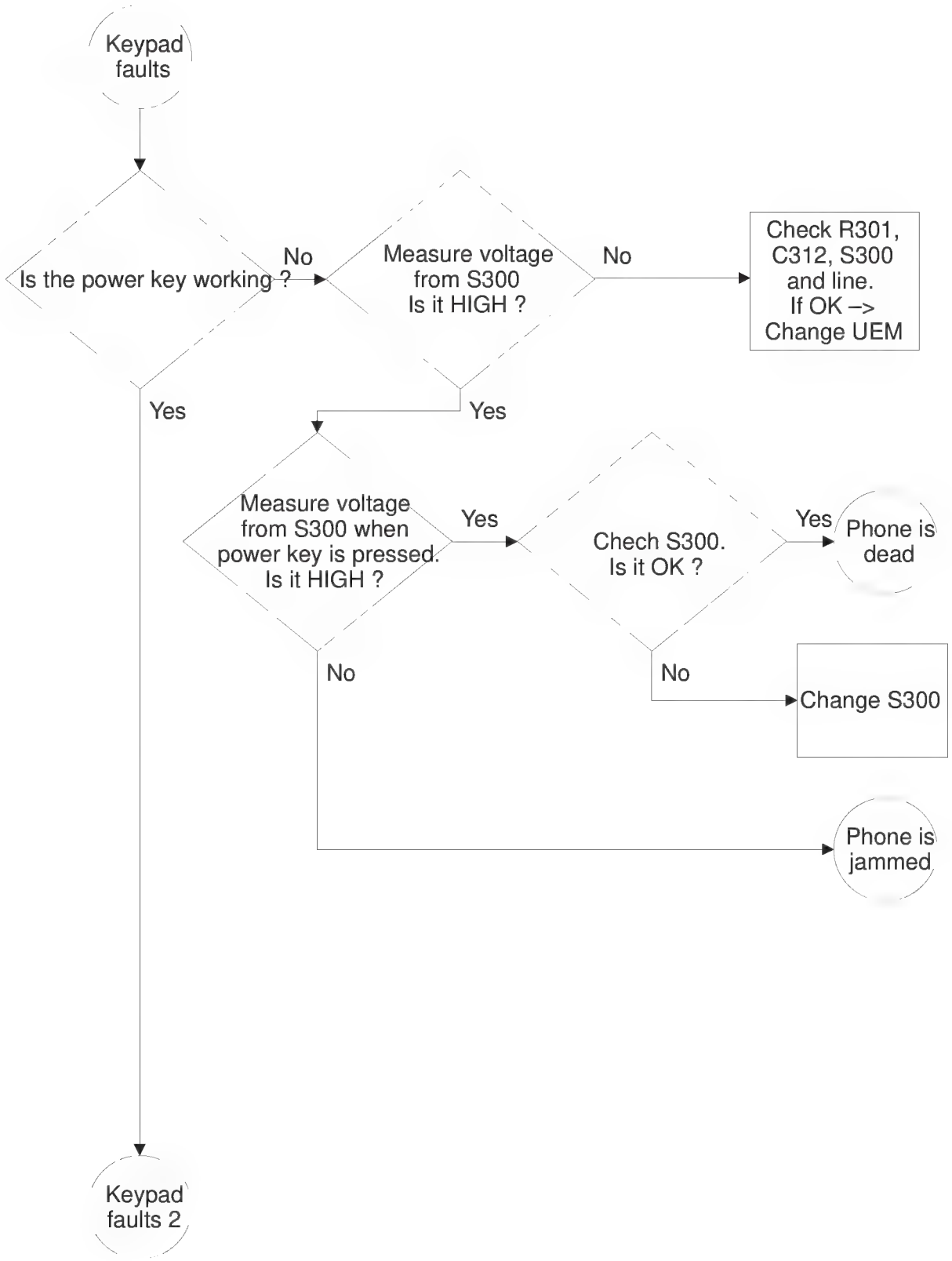
Keypad fault



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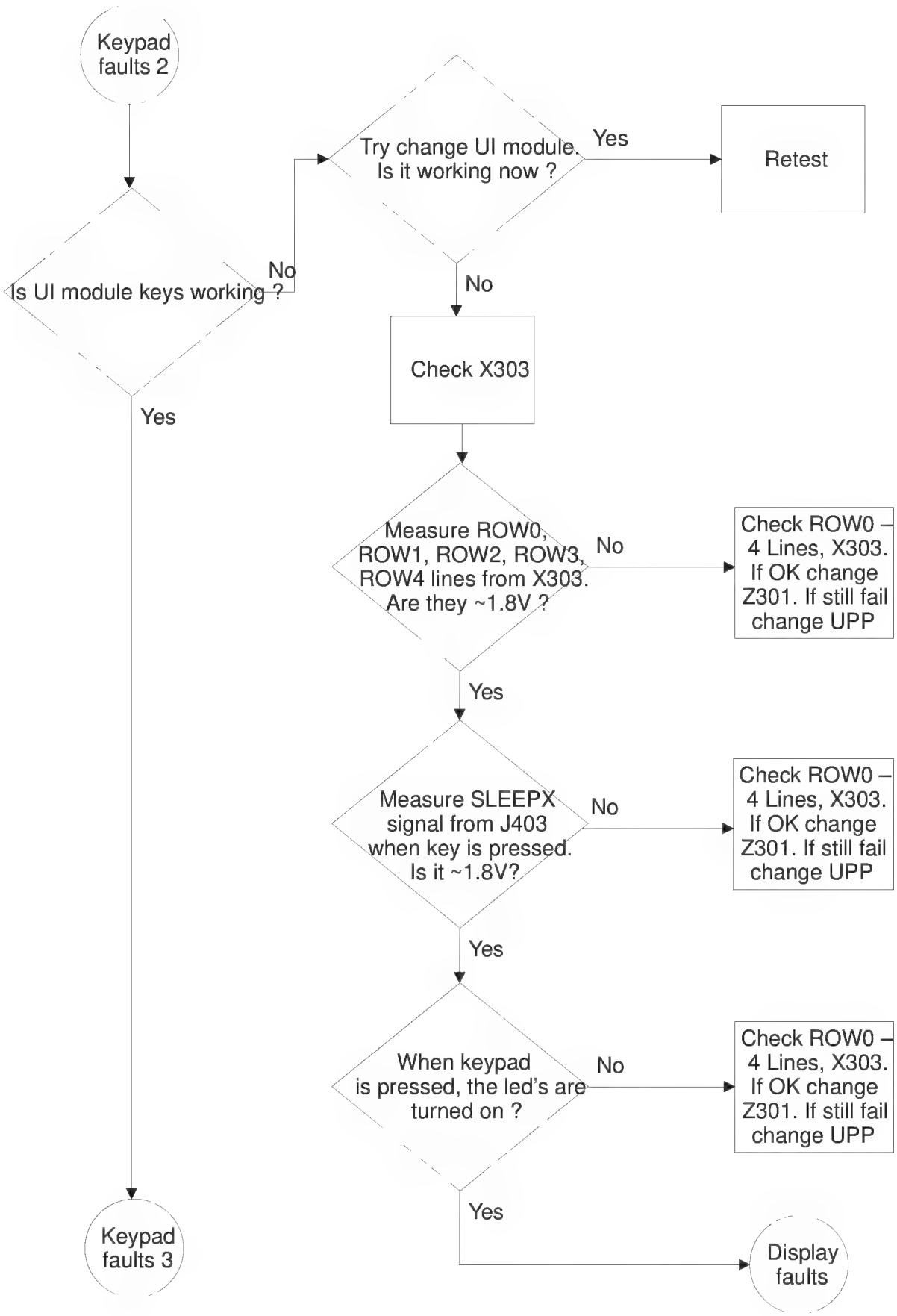
Keypad faults 2
Try change UI module. Is it working now ?
Yes
Retest
Is UI module keys working ?
No
No
Check X303
Yes
Measure ROW0, ROW1, ROW2, ROW3, ROW4 lines from X303. Are they ~1.8V ?
No
Check ROW0 – 4 Lines, X303. If OK change Z301. If still fail change UPP
Yes
Measure SLEEPX signal from J403 when key is pressed. Is it ~1.8V?
No
Check ROW0 – 4 Lines, X303. If OK change Z301. If still fail change UPP
Yes
When keypad is pressed, the led's are turned on ?
No
Check ROW0 – 4 Lines, X303. If OK change Z301. If still fail change UPP
Yes
Keypad faults 3
Display faults

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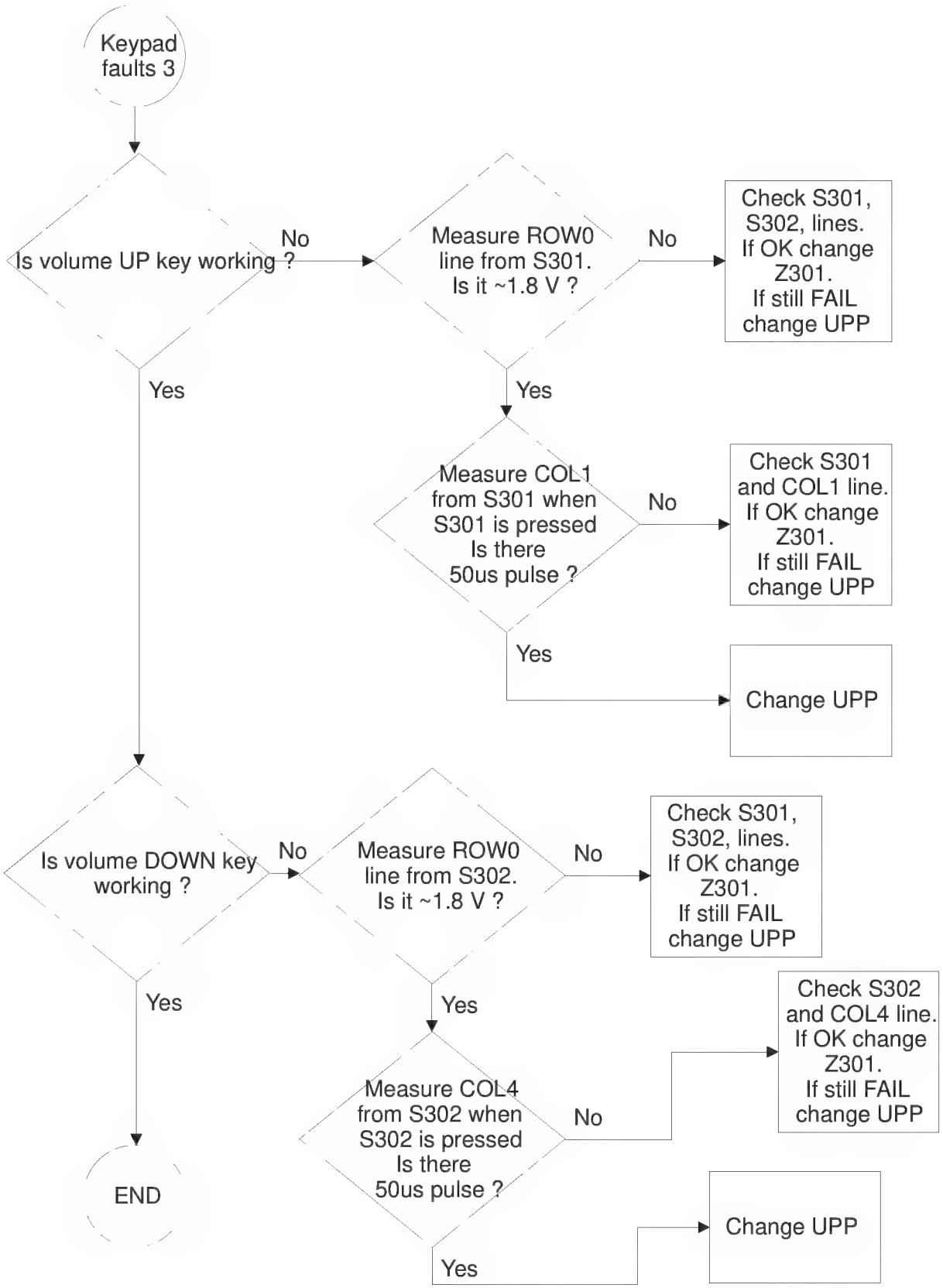
Keypad faults 3
Is volume UP key working ?
No
Measure ROW0 line from S301. Is it ~1.8 V ?
No
Check S301, S302, lines. If OK change Z301. If still FAIL change UPP
Yes
Yes
Measure COL1 from S301 when S301 is pressed Is there 50us pulse ?
No
Check S301 and COL1 line. If OK change Z301. If still FAIL change UPP
Yes
Change UPP
Is volume DOWN key working ?
No
Measure ROW0 line from S302. Is it ~1.8 V ?
No
Check S301, S302, lines. If OK change Z301. If still FAIL change UPP
Yes
Yes
Check S302 and COL4 line. If OK change Z301. If still FAIL change UPP
Measure COL4 from S302 when S302 is pressed Is there 50us pulse ?
No
END
Change UPP
Yes

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RF Troubleshooting

Introduction

Measurements should be done using spectrum analyzer with high–frequency high–impedance passive probe (LO–/reference frequencies and RF power levels) and oscilloscope with a 10:1 probe (DC–voltages and low frequency signals).

The RF–section is build around one RF–ASIC (HAGAR N600). Before changing HAGAR, please check following things: Supply voltages are OK and serial communication coming from baseband to HAGAR.

Please note: Grounding of the PA module is directly below PA module making it difficult to check or change. **Most RF semiconductors are static discharge sensitive!** So ESD protection must be taken care of during repair (ground straps and ESD soldering irons). HAGAR and PA are moisture sensitive and must be pre–baked prior to soldering.

Troubleshooting discrete components (resistors, inductors and capacitors) is done by checking component soldering. Capacitors can be checked for shortening and resistor values using an ohmmeter, but remember in–circuit measurements are evaluated with caution.

Remember that all measured voltages or RF levels in this document are rough figures. Especially RF levels vary due to different measuring equipment or different probe grounding used . When using RF probe it is good to use metallic tweezers to connect probe ground to PWB ground as close to measurement point as possible.

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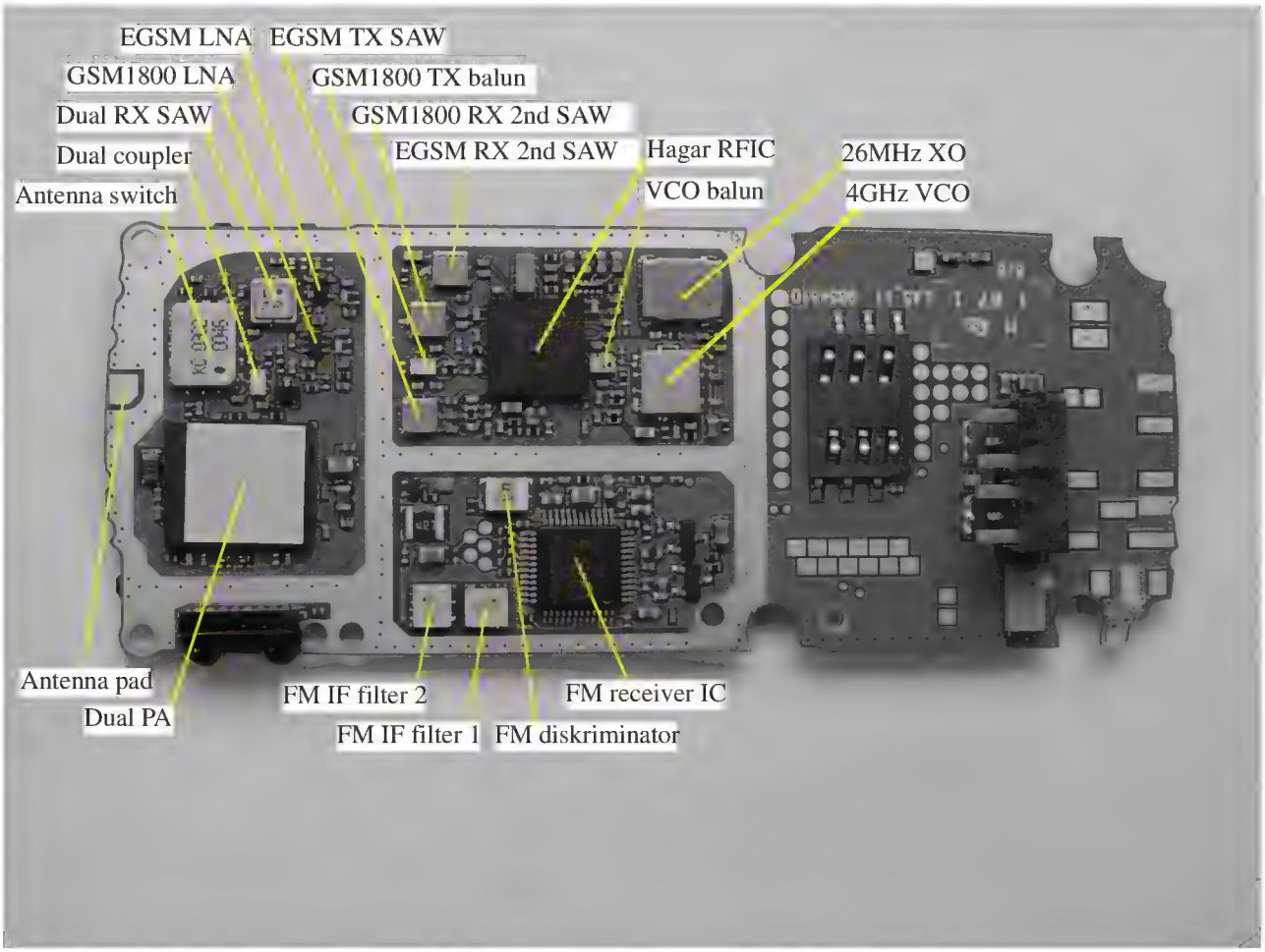
RF Key Components



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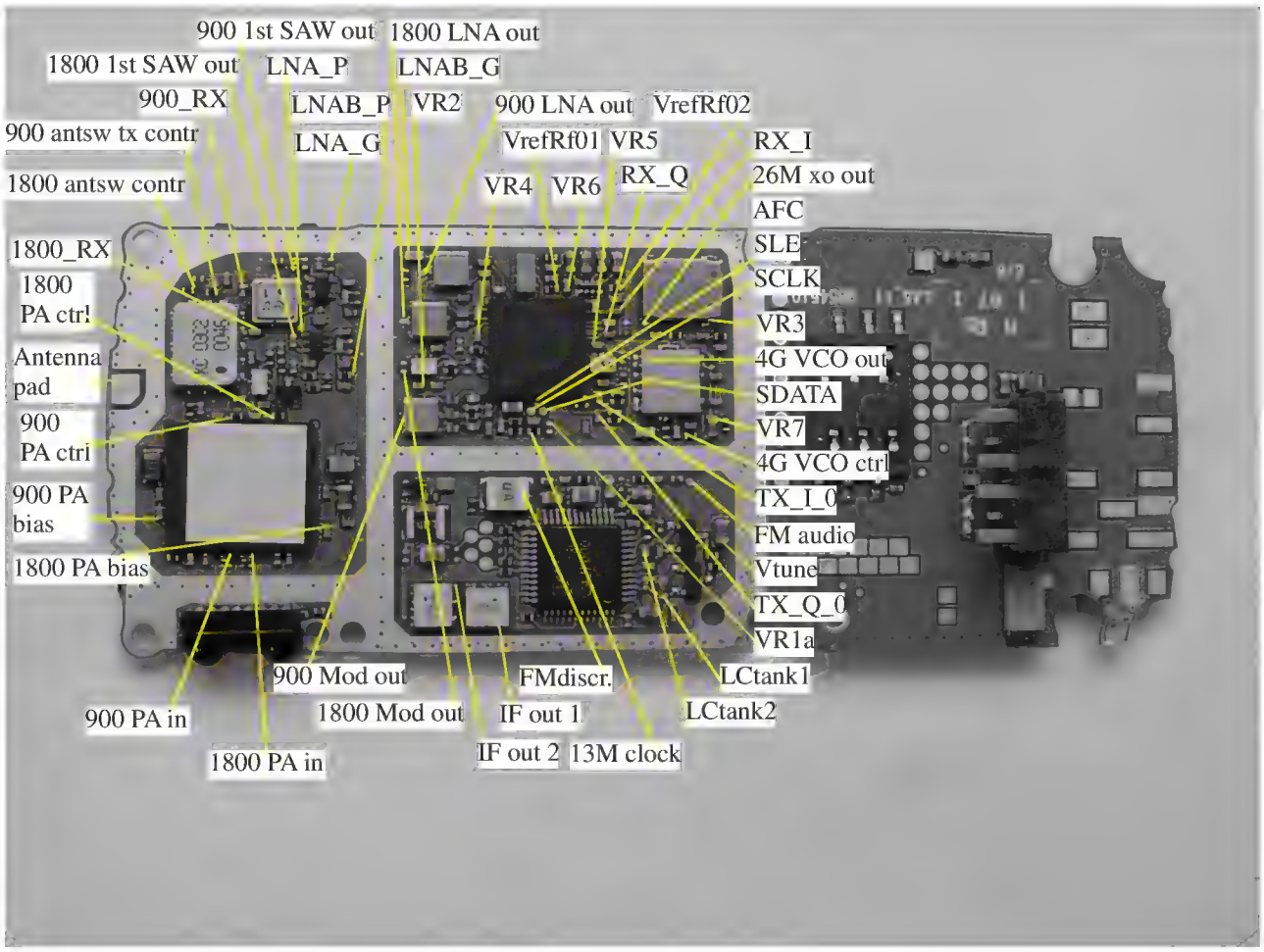
PWB Test Points



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Transmitter

General instructions

Connect test jig to computer with DAU9S cable or to FPS–8 Flash Prommer with XCS–4 modular cable.

Make sure that you have PKD–1 dongle connected to computers parallel port.

Connect DC power supply to module test jig with FLC–2 cable.

NOTE: When repairing or tuning transmitter use external DC supply with at least 3A current capability. Set the DC supply voltage to 3.9V and set the jumper connector on test jig to "bypass" position.

Connect RF–cable to the module test jig (MJS–46) RF connector and to measurement equipment or at least 10dB attenuator, otherwise the PA may be damaged. Normally spectrum analyzer is used as measurement equipment.

NOTE: Normally Spectrum analyzer maximum input power is +30dBm. It is recommended to use 10dB attenuator on Spectrum analyzer input to prevent damage.

Set the phone module to test jig and start Phoenix service sofware.

Initialize connection to phone. (use FBUS driver when using DAU9S and COMBOX driver when using FPS–8)

Select product from the menu: File –> Choose product –> NPM–9

From toolbar set operating mode to "Local".

Activate RF controls window from the menu:
Maintenance –> Tuning –> RF Controls

From the RF controls window:
– Select band "GSM900" or "GSM 1800" (Default = "GSM900")
– Set Active unit to "Tx" (Default = "Rx")
– Set Operation mode to "Burst" (Default = "Burst")
– Set Tx data type to "Random" (Default = "All1")
– Set Rx/Tx channel to 37 on GSM900 band or 700 on GSM1800 band (Defaults)
– Set Tx PA mode to "Free" (Default)
– Set power level to 5 (Default = 19) on GSM900 or to 0 (Default = 15) on GSM1800

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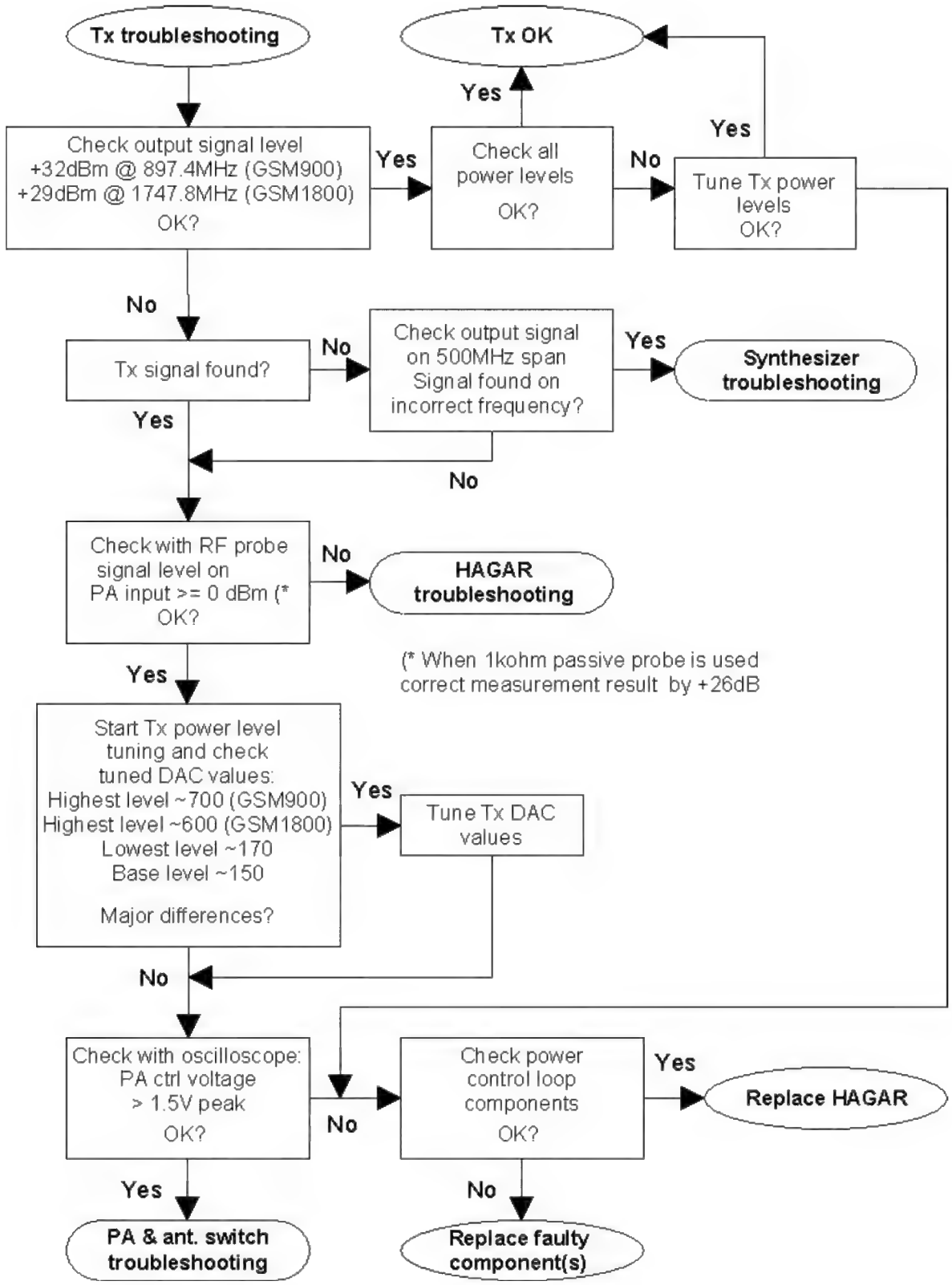
Transmitter troubleshooting diagram



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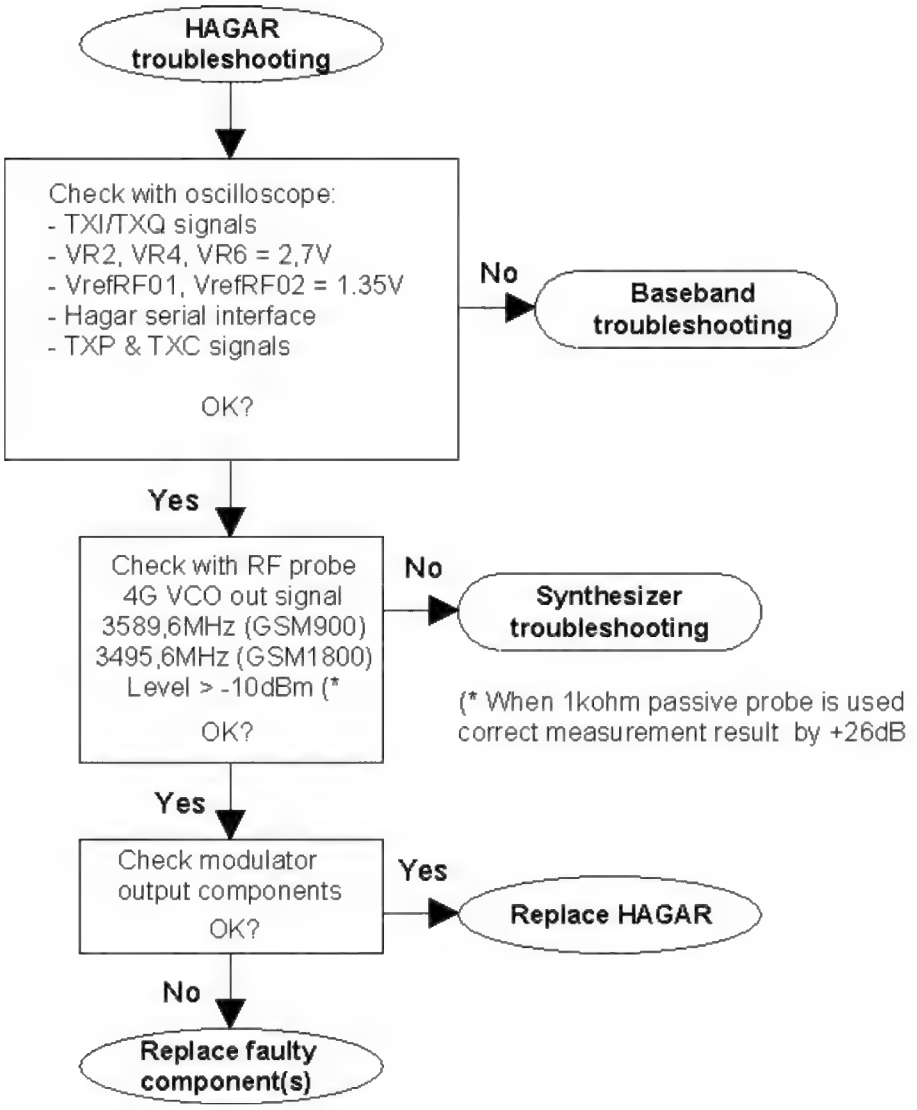

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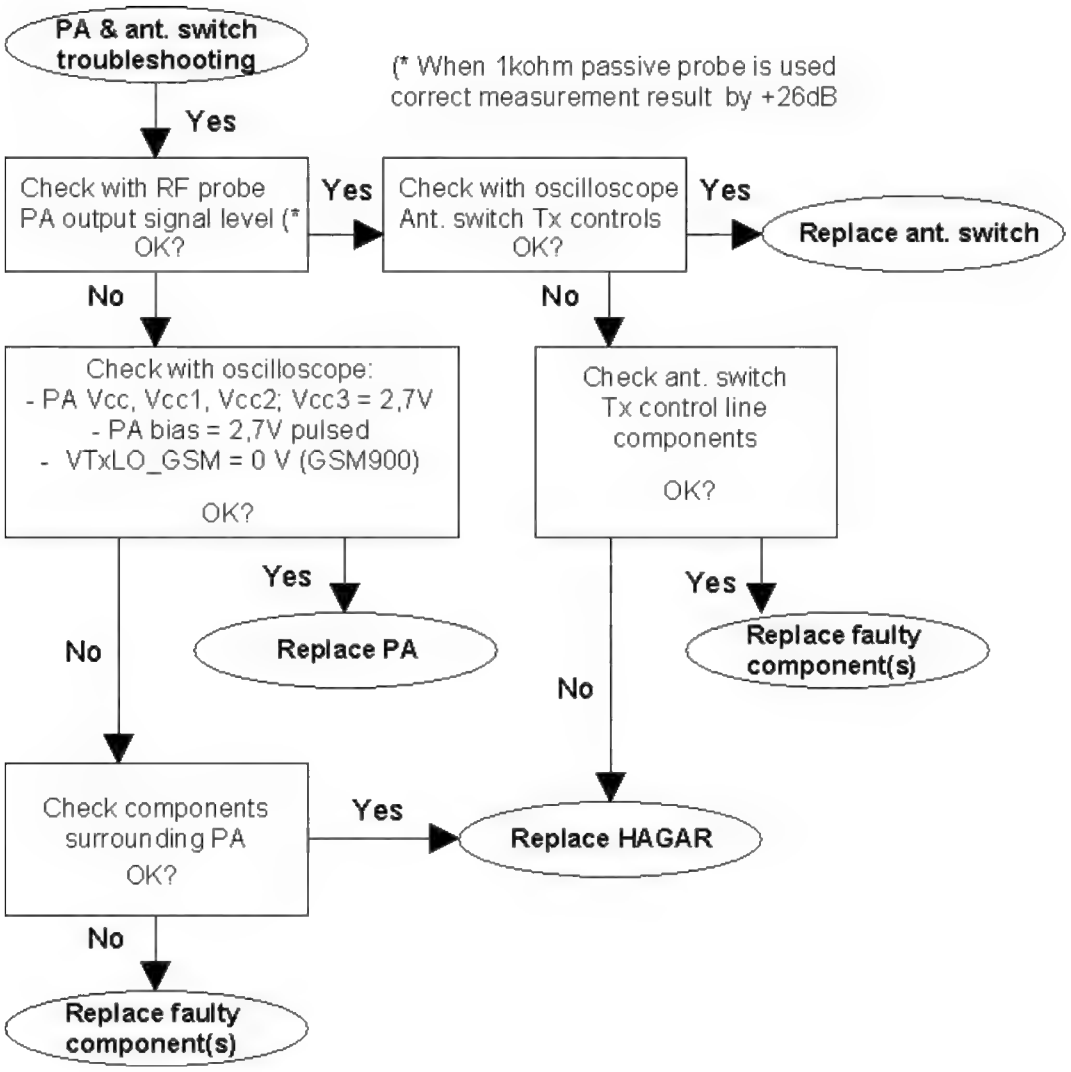

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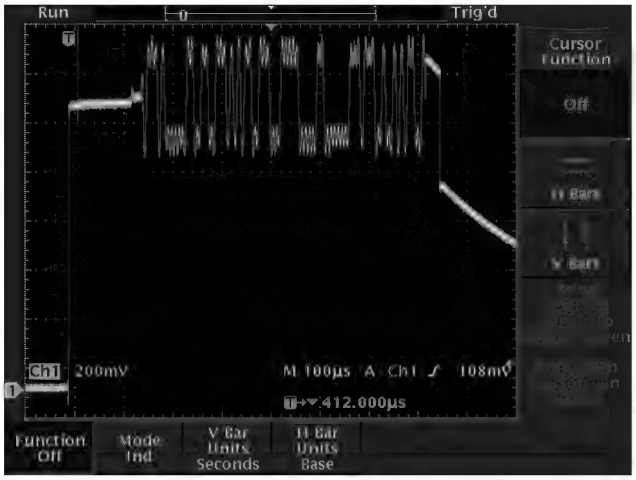
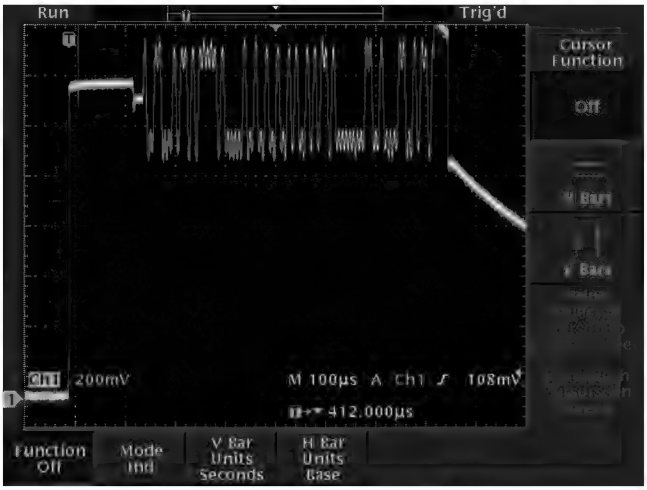
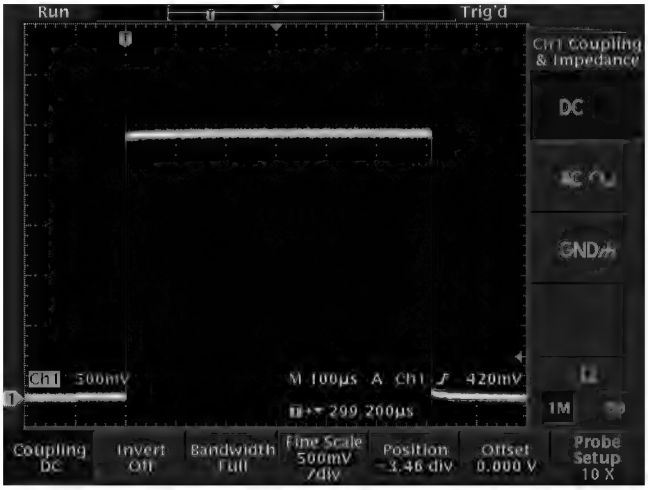
Transmitter signals



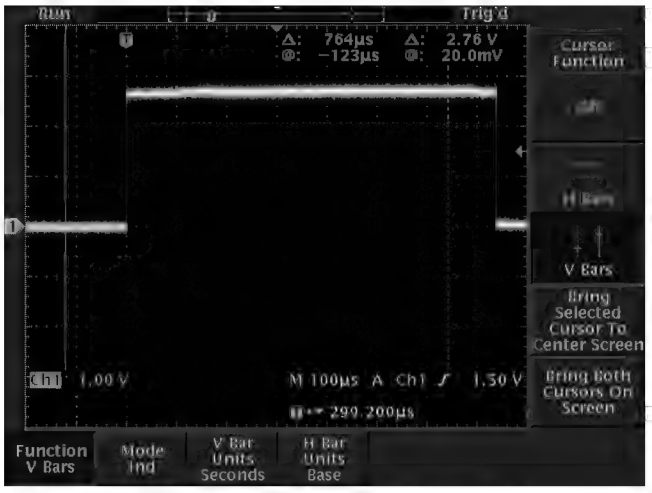
TX_I_0, Tx on, Random data, Burst mode



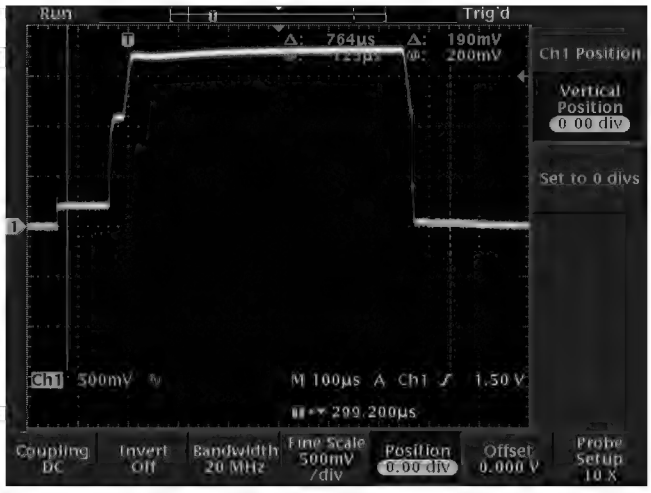
TX_Q_0, Tx on, Random data, Burst mode



900/1800 antsw tx contr, Tx on, Burst mode



900/1800 PA bias, Tx on, Burst mode



900/1800 PA ctrl, Tx on, Burst mode, High power level

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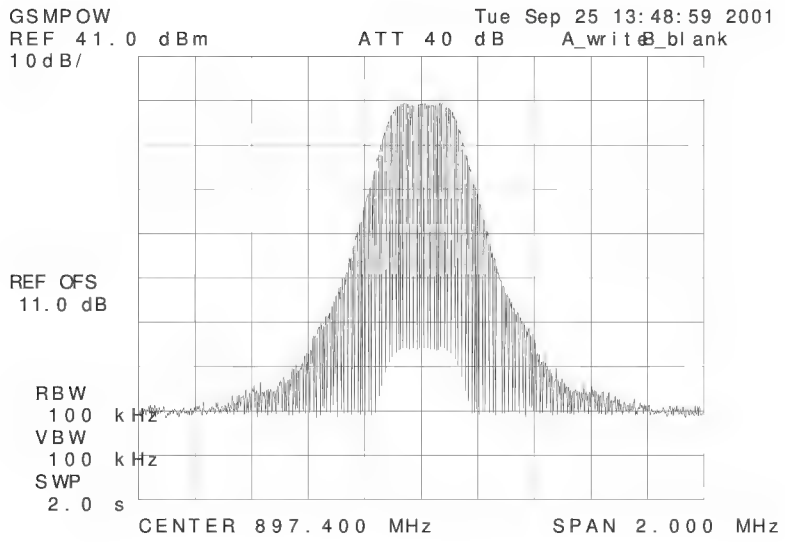

Tx out signal, 900 band, burst mode, channel 37

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Receiver

General instructions

Connect test jig to computer with DAU9S cable or to FPS–8 Flash Prommer with XCS–4 modular cable. Make sure that you have PKD–1 dongle connected to computers parallel port.

Connect DC power supply to module test jig with FLC–2 cable. Set the DC supply voltage to 3.9V and set the jumper connector on test jig to "bypass" position.

Connect RF–cable to the module test jig (MJS–46) RF connector and to RF signal generator.

Set the phone module to test jig and start Phoenix service sofware.

Initialize connection to phone. Use FBUS driver when using DAU9S and COMBOX driver when using FPS–8.

Choose product from the menu: File –> Choose product –> NPM–9.

From toolbar set operating mode to "Local".

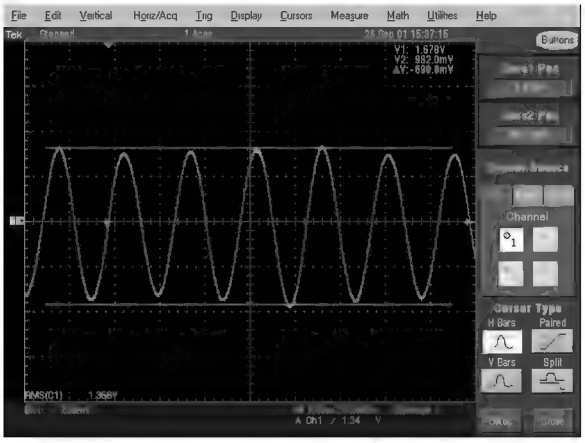
Activate RF controls window from the menu: Maintenance –> Testing –> RF Controls.

From the RF controls window:

– Select band "GSM900" or "GSM 1800" (Default = "GSM900")
– Set Active unit to "Rx" (Default = "Rx")– Set Operation mode to "Continuous" (Default = "Burst")
– Set AGC to "8: FEG ON + 46 dB (Default = "8: FEG ON + 46 dB")
– Set Rx/Tx channel to 37 on GSM900 band or 700 on GSM1800 band (Defaults)

Apply 942.46771 MHz (channel 37 + 67.710 kHz offset) or 1842.86771 MHz (channel 700 + 67.710 kHz offset) –90 dBm signal to the RF–connector (remember to compensate for cable attenuation).

Measuring with an oscilloscope on "RX_I" or "RX_Q" this picture should be seen on a working GSM900 or GSM1800 receiver:



Signal amplitude is 700 mVpp, DC offset 1.35 V and frequency 67 kHz. If this picture is not seen, continue to the next page.

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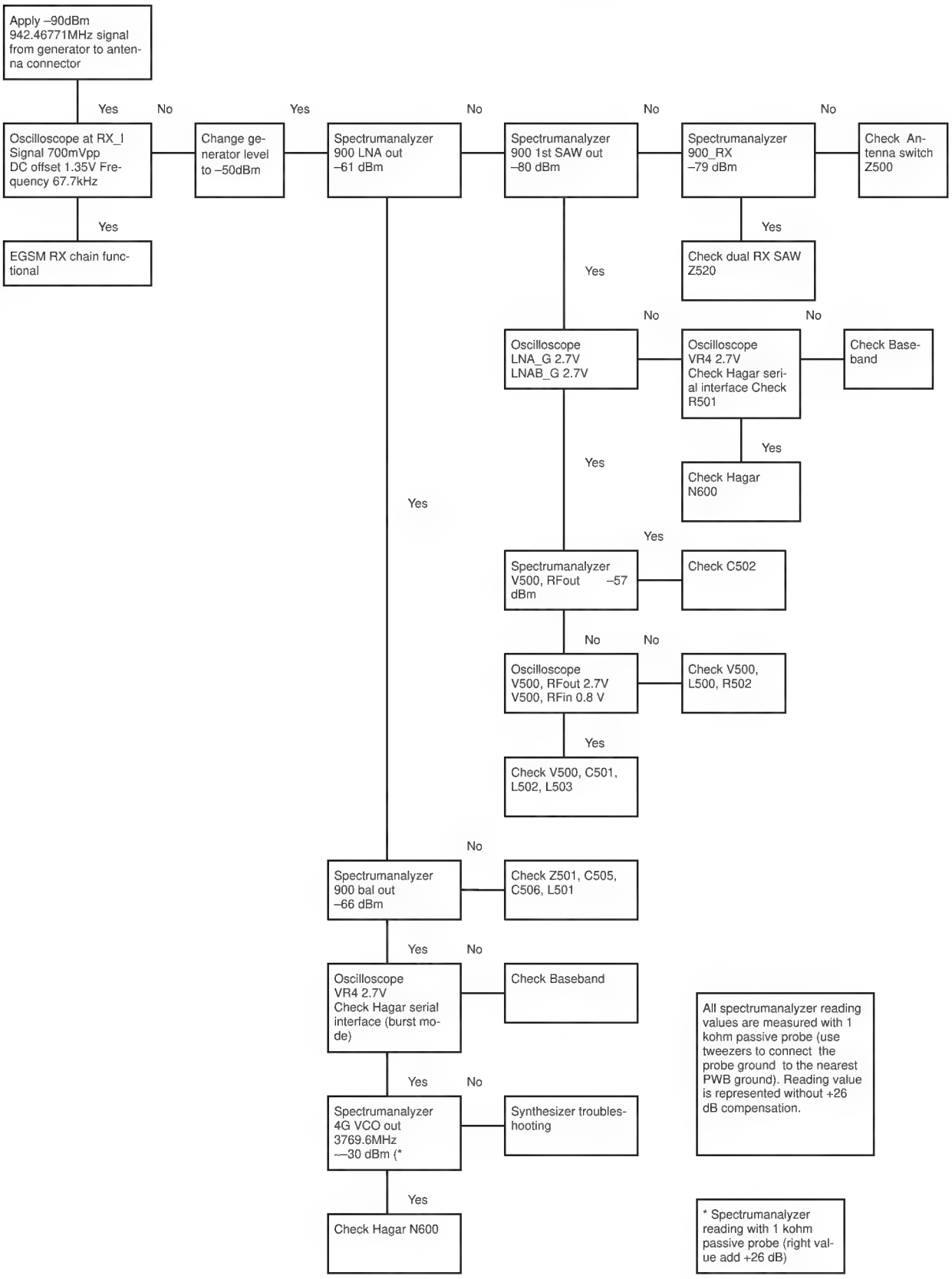
Receiver troubleshooting diagram for GSM900



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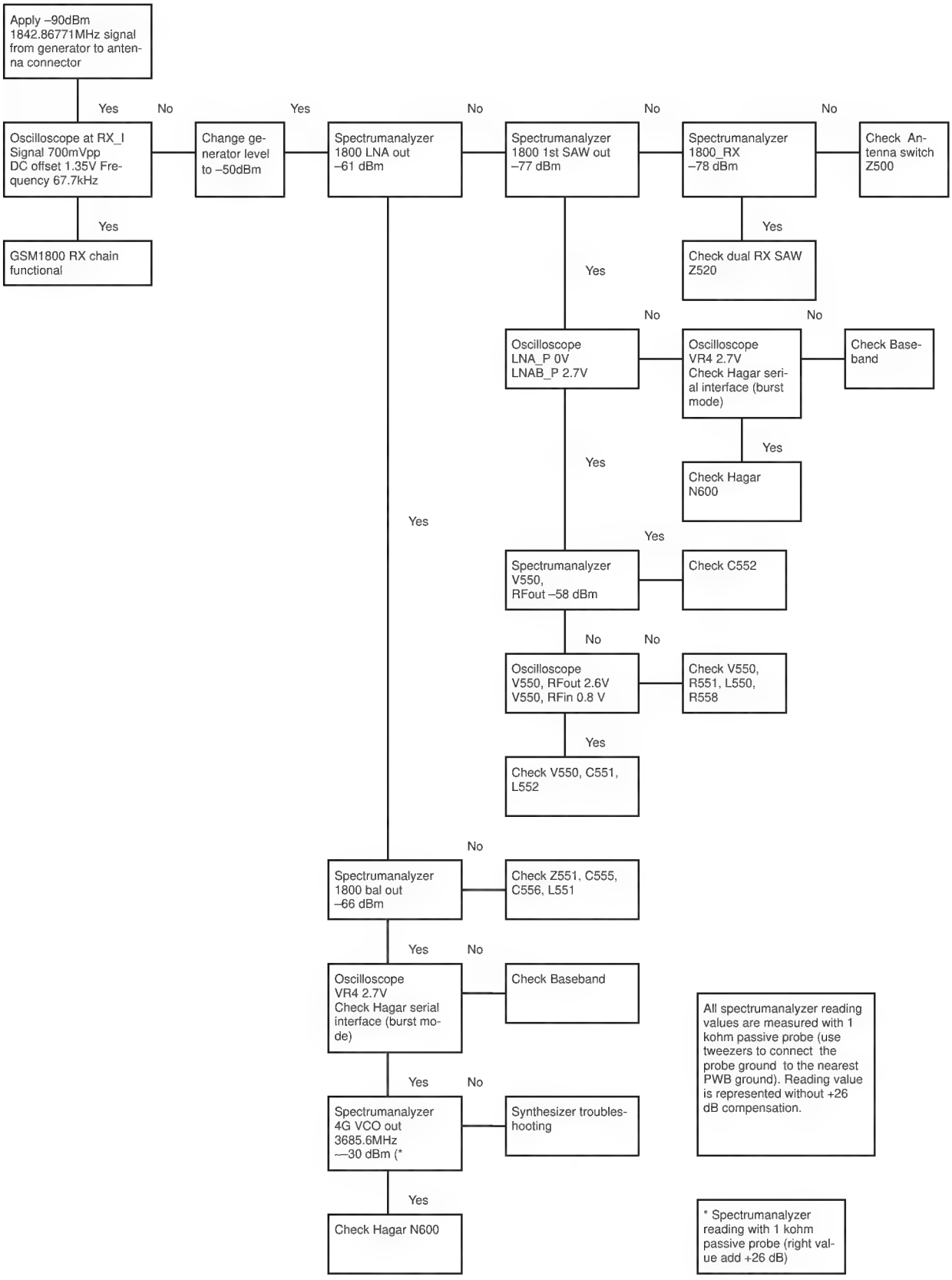
Receiver troubleshooting diagram for GSM1800


Apply –90dBm 1842.86771MHz signal from generator to antenna connector
Oscilloscope at RX_I Signal 700mVpp DC offset 1.35V Frequency 67.7kHz
Change generator level to –50dBm
Spectrumanalyzer 1800 LNA out –61 dBm
Spectrumanalyzer 1800 1st SAW out –77 dBm
Spectrumanalyzer 1800_RX –78 dBm
Check Antenna switch Z500
GSM1800 RX chain functional
Check dual RX SAW Z520
Oscilloscope LNA_P 0V LNAB_P 2.7V
Oscilloscope VR4 2.7V Check Hagar serial interface (burst mode)
Check Baseband
Check Hagar N600
Spectrumanalyzer V550, RFout –58 dBm
Check C552
Oscilloscope V550, RFout 2.6V V550, RFin 0.8 V
Check V550, R551, L550, R558
Check V550, C551, L552
Spectrumanalyzer 1800 bal out –66 dBm
Check Z551, C555, C556, L551
Oscilloscope VR4 2.7V Check Hagar serial interface (burst mode)
Check Baseband
Spectrumanalyzer 4G VCO out 3685.6MHz —30 dBm (*
Synthesizer troubleshooting
Check Hagar N600
Yes
No
All spectrumanalyzer reading values are measured with 1 kohm passive probe (use tweezers to connect the probe ground to the nearest PWB ground). Reading value is represented without +26 dB compensation.
* Spectrumanalyzer reading with 1 kohm passive probe (right value add +26 dB)

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LNA gainstep checking GSM900 & GSM1800

900 LNA out	1800 LNA out
– RF–level at antenna port eg. –50 dBm – RX continuous mode (local mode) – difference between AGC –settings "FEG on" and "FEG off" roughly 25 dB (using 250 ohm passive RF–probe)	– RF–level at antenna port eg. –50 dBm – RX continuous mode (local mode) – difference between AGC –settings "FEG on" and "FEG off" roughly 30 dB (using 250 ohm passive RF–probe)

LNAB_G	LNAB_P
– RX continuous mode (local mode) – 2,6 V DC voltage "FEG ON" – 0 V DC voltage "FEG OFF"	– RX continuous mode (local mode) – 2,7 V DC voltage "FEG ON" – 0 V DC voltage "FEG OFF"

LNA_G	1800 LNA_P
– RX continuous mode (local mode) – 2,7 V DC voltage "FEG ON" and "FEG OFF"	– RX continuous mode (local mode) – 0 V DC voltage "FEG ON" – 1.9 V DC voltage "FEG OFF"

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Synthesizer

General instructions

Connect test jig to computer with DAU–9S cable or to FPS–8 Flash Prommer with XCS–4 modular cable.

Make sure that you have PKD–1 dongle connected to computers parallel port.

Connect DC power supply or FPS–8 to module test jig with FLC–2 cable.

Set the DC supply voltage to 3.9V and set the jumper connector on test jig to "bypass" position.

Set the phone module to test jig and start Phoenix service sofware.

Initialize connection to phone. (use FBUS driver when using DAU–9S and COMBOX driver when using FPS–8)

Select product from the menu: File –> Choose product –>NPM–9

From toolbar set operating mode to "Local".

Activate RF controls window from the menu:
Maintenance –> Tuning –> RF Controls

From the RF controls window:

– Select band "GSM900" or "GSM 1800" (Default = "GSM900")
– Set Active unit to "Rx" (Default = "Rx")
– Set Operation mode to "Continuous" (Default = "Burst")
– Set Rx/Tx channel to 37 on GSM900 band or 700 on GSM1800 band (Defaults)

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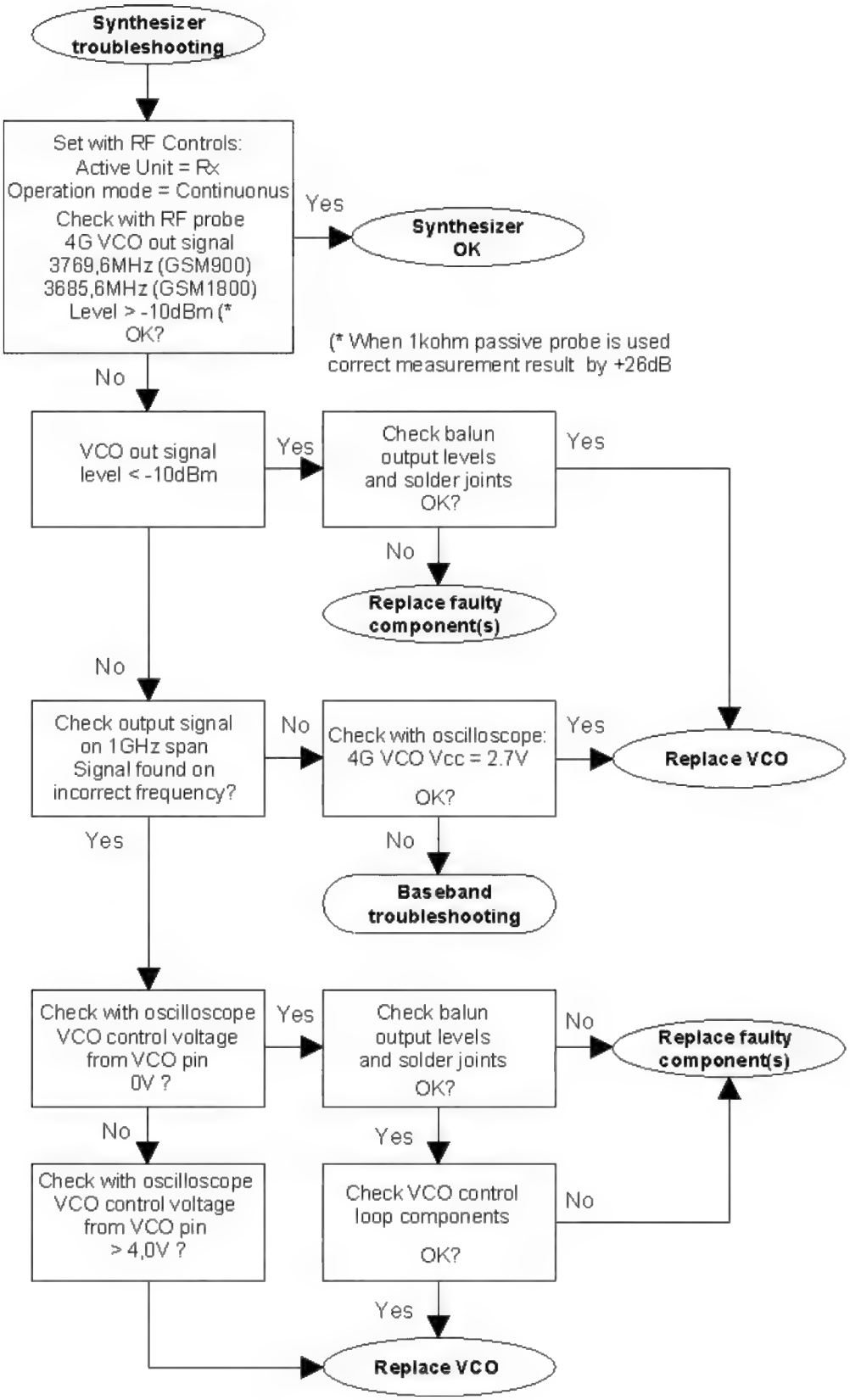
Synthesizer troubleshooting diagram



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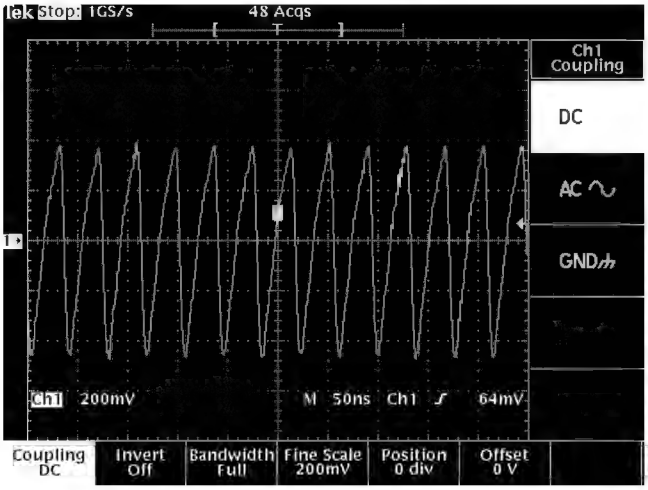
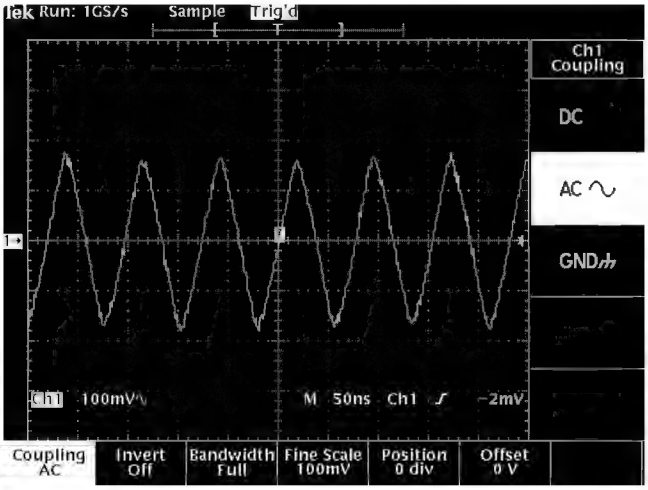
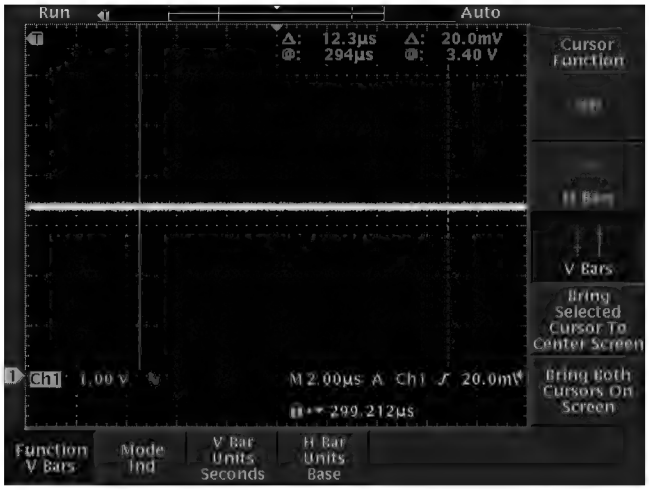
Synthesizer signals



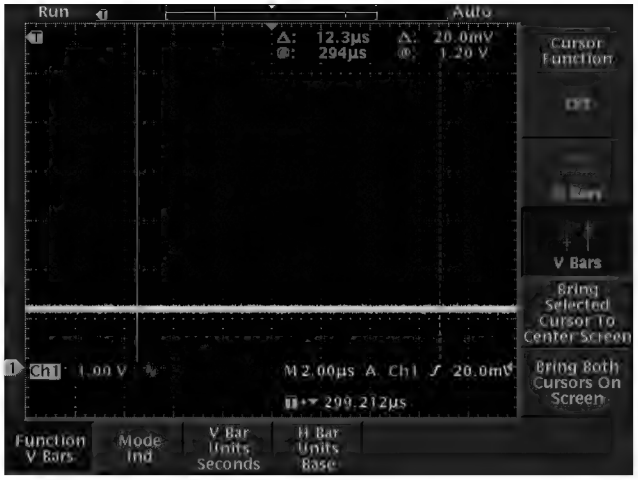
26MHz XO out



13MHz clock



4GHz VCO ctrl
900 RX, channel 124, continuous mode



4GHz VCO ctrl
1800 TX, channel 512, continuous mode

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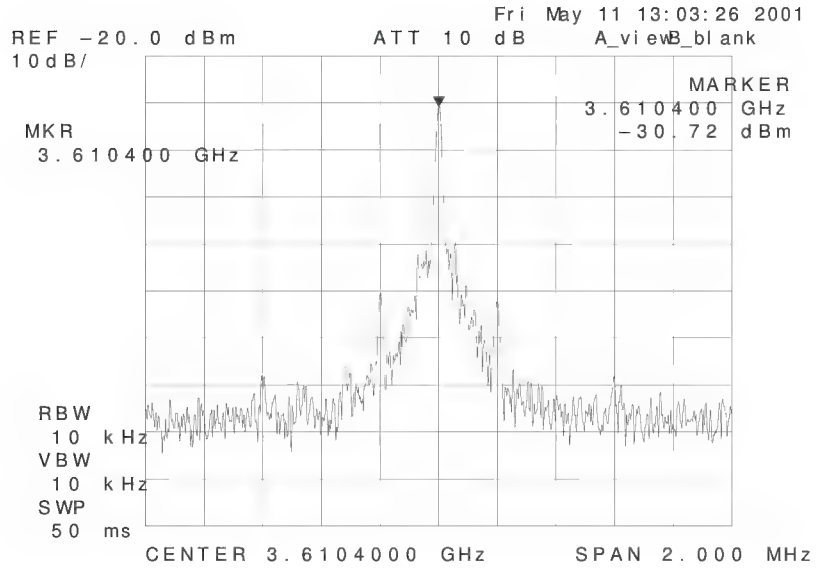

4GHz VCO output, 1800 band, RX on, continuous mode

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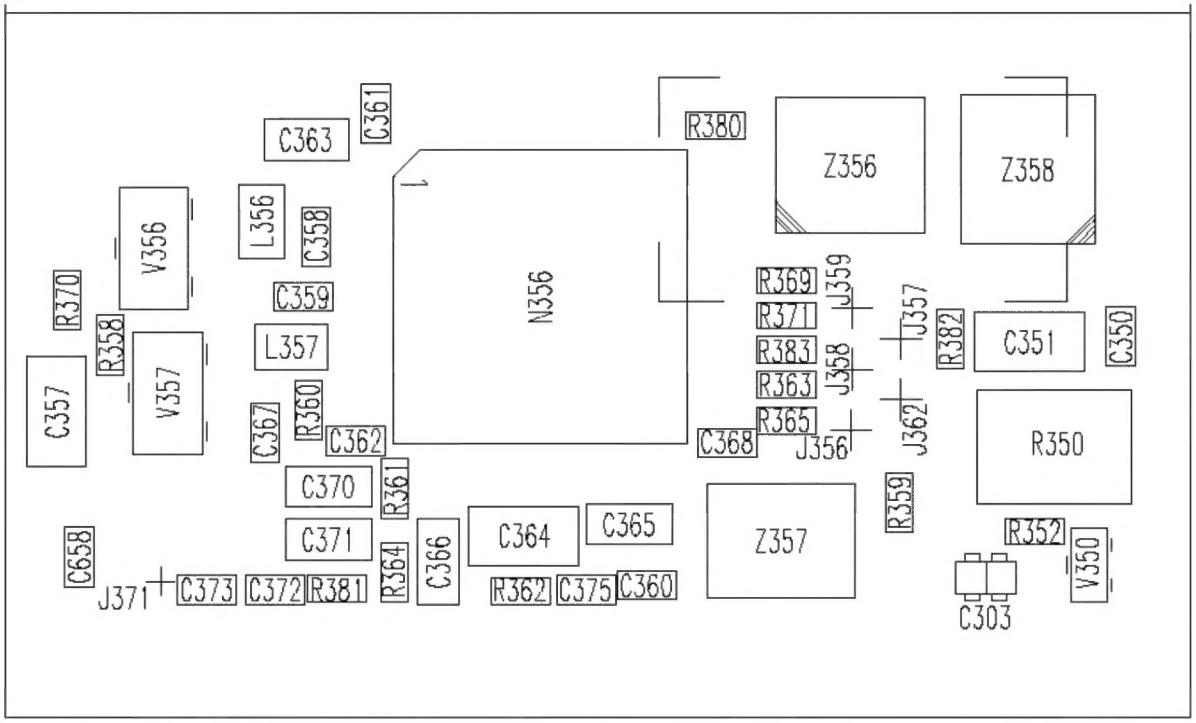
FM Radio troubleshooting



FM Radio component layout

Components L101, C101 and C102 are not shown in picture. Components are placed in baseband section.

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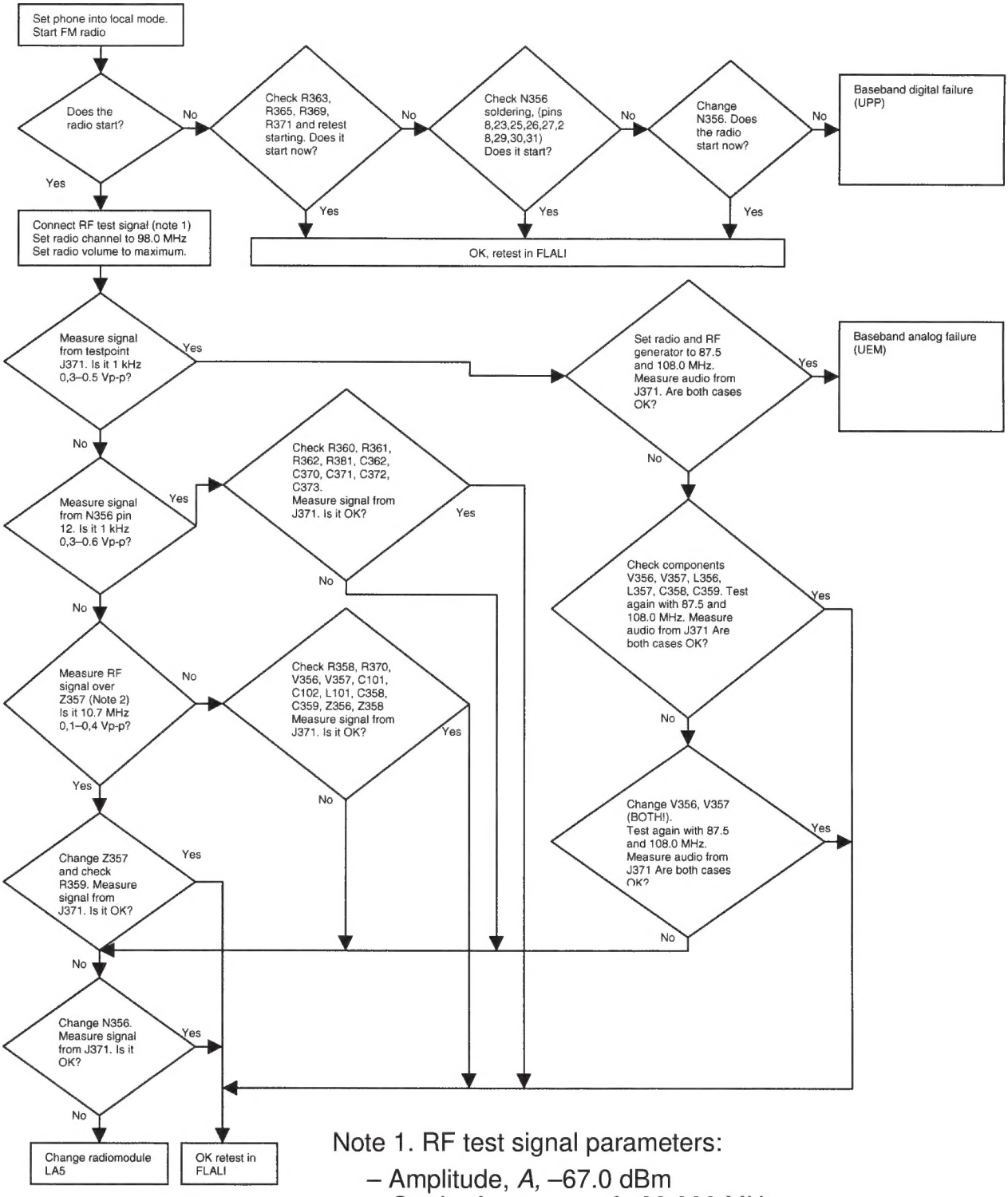
FM Radio troubleshooting diagram


Set phone into local mode.
Start FM radio
Does the radio start?
No
Check R363, R365, R369, R371 and retest starting. Does it start now?
No
Check N356 soldering, (pins 8,23,25,26,27,2 8,29,30,31) Does it start?
No
Change N356. Does the radio start now?
No
Baseband digital failure (UPP)
Yes
Yes
Yes
Yes
Connect RF test signal (note 1)
Set radio channel to 98.0 MHz
Set radio volume to maximum.
OK, retest in FLALI
Measure signal from testpoint J371. Is it 1 kHz 0,3–0.5 Vp-p?
Yes
Set radio and RF generator to 87.5 and 108.0 MHz. Measure audio from J371. Are both cases OK?
Yes
Baseband analog failure (UEM)
No
No
Measure signal from N356 pin 12. Is it 1 kHz 0,3–0.6 Vp-p?
Yes
Check R360, R361, R362, R381, C362, C370, C371, C372, C373. Measure signal from J371. Is it OK?
Yes
Check components V356, V357, L356, L357, C358, C359. Test again with 87.5 and 108.0 MHz. Measure audio from J371 Are both cases OK?
Yes
No
No
No
Measure RF signal over Z357 (Note 2) Is it 10.7 MHz 0,1–0,4 Vp-p?
No
Check R358, R370, V356, V357, C101, C102, L101, C358, C359, Z356, Z358 Measure signal from J371. Is it OK?
Yes
Change V356, V357 (BOTH!). Test again with 87.5 and 108.0 MHz. Measure audio from J371 Are both cases OK?
Yes
Yes
No
No
Change Z357 and check R359. Measure signal from J371. Is it OK?
Yes
No
Change N356. Measure signal from J371. Is it OK?
Yes
No
Change radiomodule LA5
OK retest in FLALI

Note 1. RF test signal parameters:

- Amplitude, *A*, –67.0 dBm
- Carrier ferquency, f_c, 98,000 MHz
- Deviation, Δf, 75 kHz
- Modulating frequency f_m, 1,000 kHz

(RF generator internal)

Note 2. Use 10x probe. Compare measured RF signal level to a known good product.

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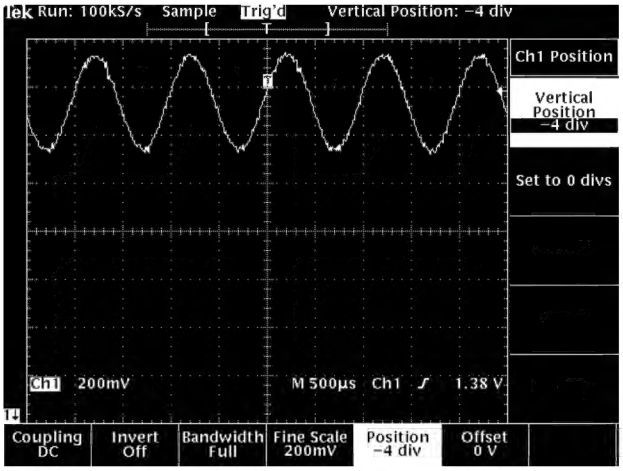
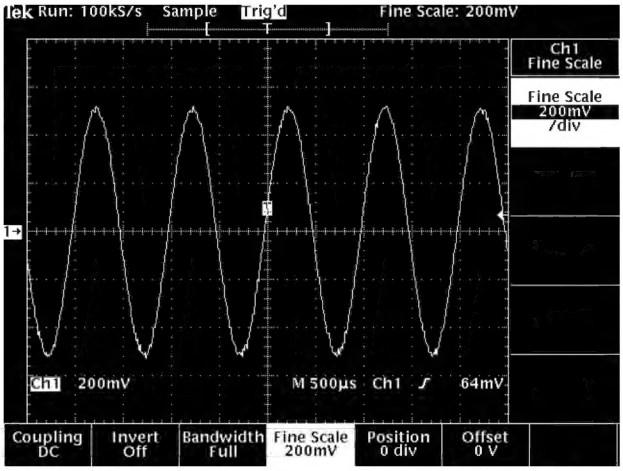
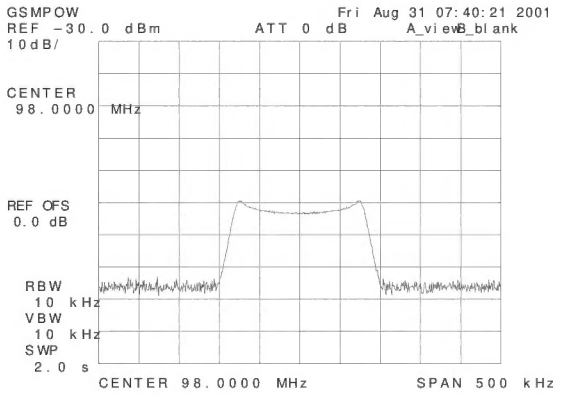
FM Radio signals



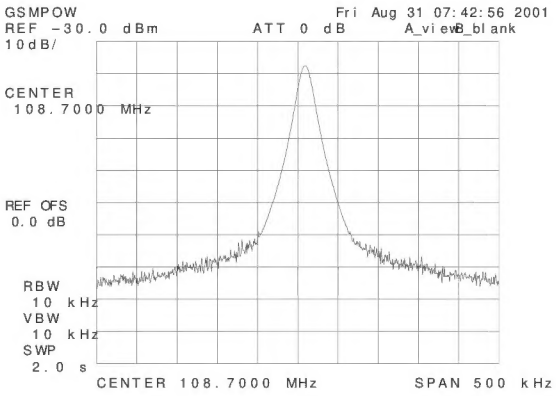
Audio out from PWB test point – with FM test signal.



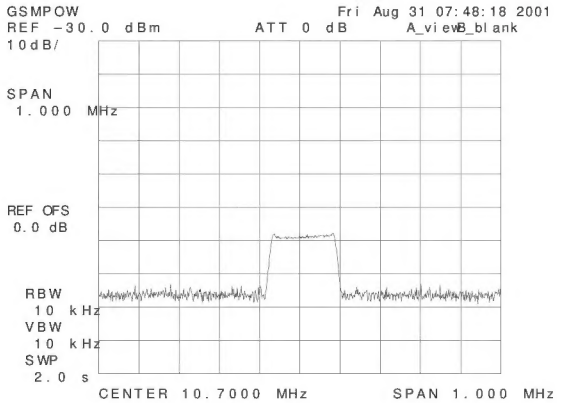
Audio out from test jig connector – with FM test signal, volume 100%.



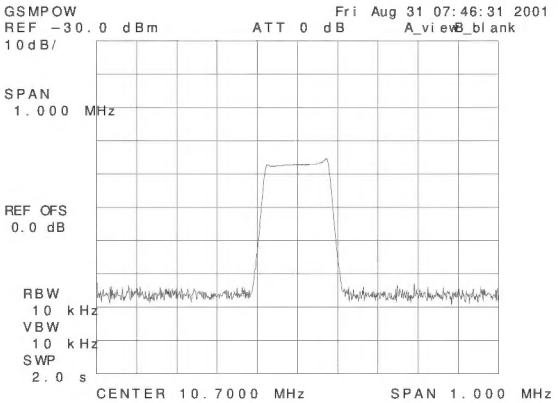
LC tank 1 – with FM test signal.



LC tank 2 – with FM test signal.



IF out 1 – with FM test signal.



IF out 2 – with FM test signal.

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